HEALTH AND GROWTH SERIES

ADVENTURES IN HEALTH

CHARTERS · SMILEY · STRANG

John F. Remsberg. 1937.

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FOREWORD TO THE TEACHER

The major objectives of the authors in preparing the *Health and Growth* series were initially defined with clarity and kept in mind with consistency in the preparation of the texts.

In order to bring to the construction of the series the best thought concerning what should go into the books and how they should be organized, exhaustive basic studies of a wide variety were carried on over an extended period of time:

Statistics concerning the incidence of children's diseases and accidents were collected and interpreted to provide an indication of the school age at which materials upon these subjects should be most appropriately taught. Health columns in newspapers and health bulletins for laymen were analyzed to discover the vocabulary children should be taught to enable them to continue to read intelligently popular health articles after graduation and in adult life. The difficulty of words was ascertained for each grade to enable the authors to use words known by eighty per cent of the class, except necessary technical terms which would be carefully explained. A complete list of such preliminary studies made is given in the *Teachers' Manual.*

The initial purpose of this series, as it should be of any series of textbooks, is to lead the child to like the subject — to make its mastery so interesting that it becomes a favorite subject of study. The primary method of creat-

ing this interest is to teach a unit when the learner sees a good reason for its introduction — precautions when colds are in season, safety in the "accident years" of childhood. Supplementary methods are legion. They include, of course, illustrations that depict real health situations.

A second objective that has special significance in this field is to establish habits of health. To that end what one *does* is of more importance than what one *knows*. Good health is maintained by actions and not by knowledge alone. To acquire habits of right living, no time is so opportune as the period of childhood. All methods of habit building should be used — interest in the activity, an understanding of its physiological purpose, repetition until habituation occurs, use in varied situations, and satisfaction in the outcome.

A third objective of major importance is to furnish the child with the latest scientific information about health and disease. Much misinformation is still prevalent in the homes of the nation. This can be eradicated in the next generation only provided the child learns proved facts in the schoolroom. Much can be eradicated in the homes of this generation by the practice of having the child read his texts with his parents.

For their co-operation in the preparation of the posed photographs, the authors' indebtedness is gratefully acknowledged to Supervising Principal Charles A. Philhower, Principal B. D. Stuart of the Franklin School, and Principal G. D. Smith of the Roosevelt Junior High School of Westfield, New Jersey.

The Authors

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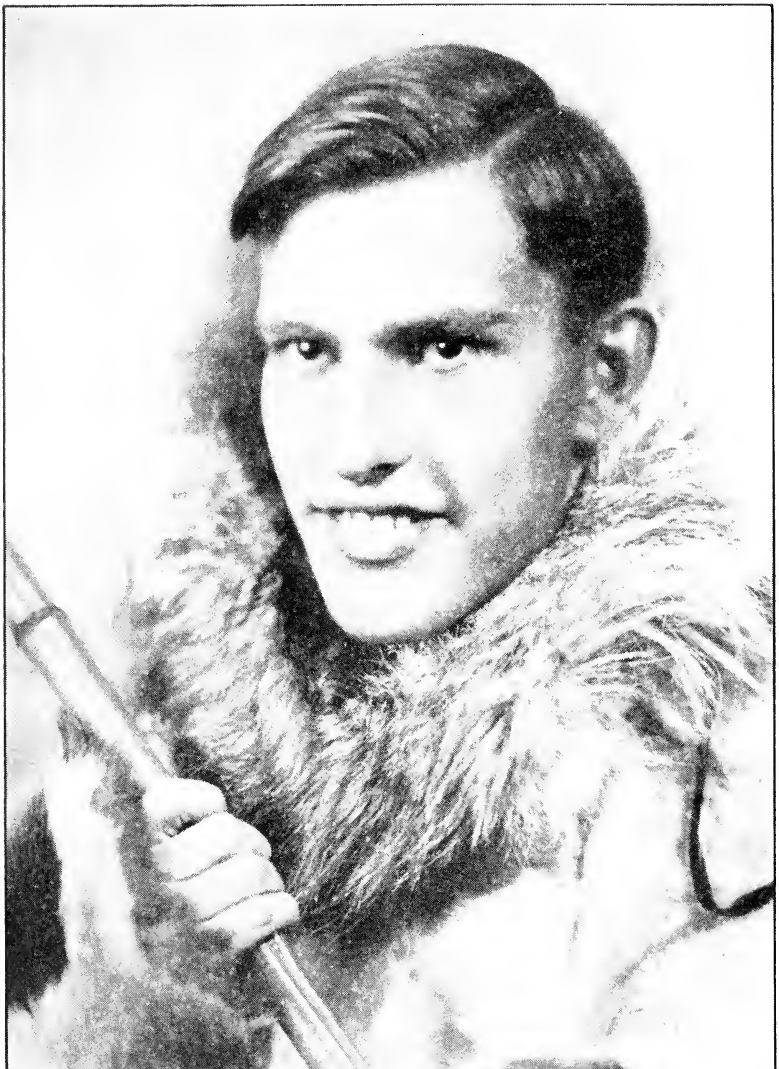
Courtesy Bryant Baker, Sculptor

The Spirit of Adventure



Wide World Photos

Paul A. Siple, a Boy Scout with Admiral Richard Byrd in Antarctica

Why was he chosen?

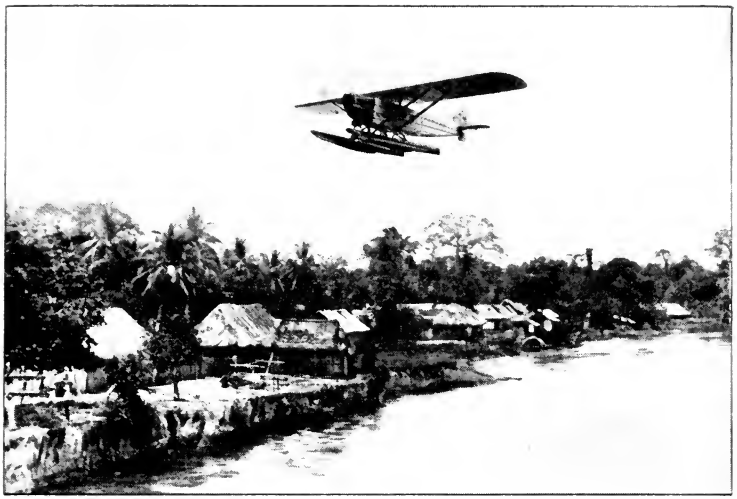


Photo by R. I. Nesmith and Associates

AIDS TO ADVENTURE

Who are the people who have adventures? Probably you think first of airplane pilots, cowboys, Indians, soldiers, explorers, and athletes.*[1] The flight to the South Pole in November, 1929, is one of the greatest adventures of modern times. As one reads the story of the preparations for this feat, he understands how necessary health and careful planning are to real adventure. Food must be small in bulk and high in food value. Even the weight of such little items as a toothbrush is considered. Clothing must protect the explorer from cold and winds and snow. Yet it must not be a drag on the wearer.

[1] Starred words are explained in the Glossary at the end of this book.

So important is sleep that the explorers spent much time on the problem of finding the best kind of sleeping bag so that they would be warm and sleep well.

Adventure is possible at home, too. There are adventures in friendship and adventure in happy family relationship. Life can be grand on a farm, or in a small town, or in a big city. Health and strength help to make it so. There are a number of aids to adventure of the best kind.

How health habits aid adventure. *Food aids adventure.* The diet that was taken on one of the last journeys toward the South Pole of previous explorers who used dog teams was carefully planned. Each man had a little more than two pounds of food a day — finely ground dried beef and fats, biscuits, sugar, powdered milk, oatmeal, chocolate, dried vegetables for soup, tea, bacon, butter, peanut butter, malted milk, cocoa, and lemon powder.

You have already learned that food may make the difference between growing and not growing, between sickness and health, and between weakness and strength. Children grow, provided other conditions of living are healthful, when they have plenty of milk, cereals, cooked vegetables, and some fruit or raw, green vegetables. They stop growing when any essential food element* is lacking in their diet. Experiments have shown that children and

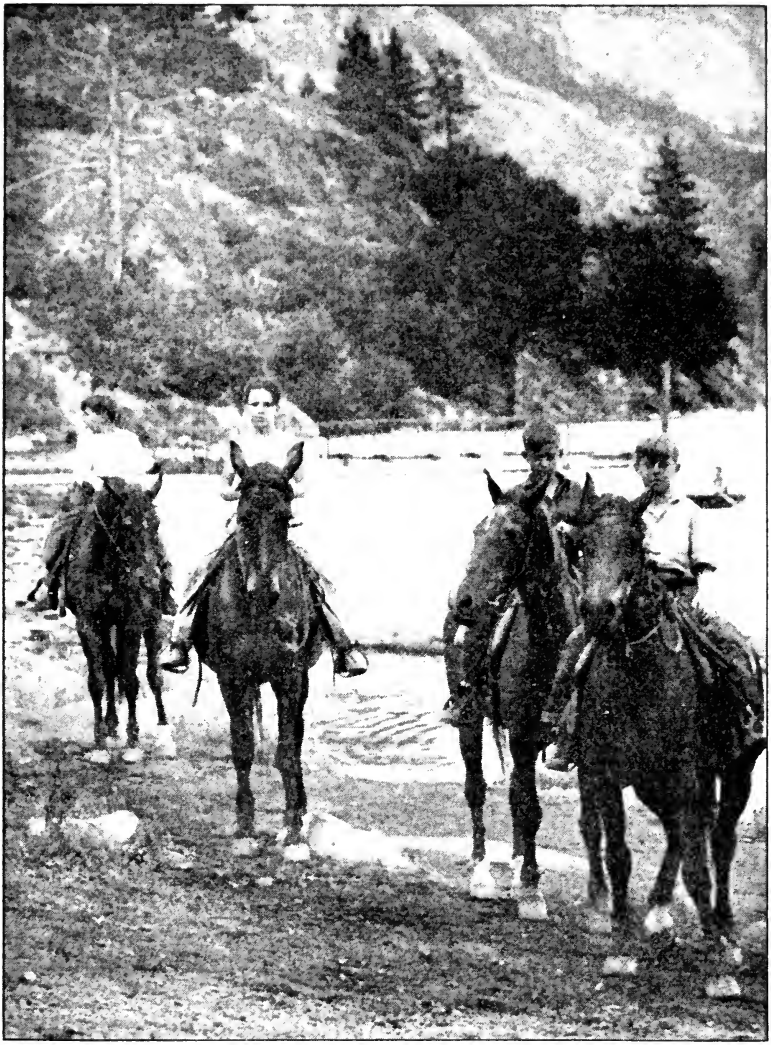


Photo from Ewing Galloway

Trained muscles help adventure.

animals become ill and weak if they lack a single essential food element. They regain health by adding to their diet the food element that is lacking.

Sleep aids adventure. During sleep the body cells are rebuilt by rest and their energy is restored. It is impossible to have vim and vigor if you get too little sleep night after night and too little rest day after day. Children whose time for sleeping was much shortened in an experiment became so cross and quarrelsome after a few days that they had to go back to their regular hours of sleep.

Suitable exercise aids adventure. By means of exercise the muscles are trained to obey. Obedient muscles often make the difference between reaching a goal and missing it. A boy or girl with trained muscles can have a glorious adventure climbing a mountain or taking a canoe or horseback trip.

Cleanliness aids adventure. If you have been camping, you know that cleanliness is given attention as soon as the camp site has been chosen. Safe water is secured. Wastes are disposed of in a sanitary* way. Campers do not run the risk of spoiling their adventure by sickness.

Avoiding fatigue and strains of all kinds aids adventure. Have you ever been too tired to enjoy yourself? Overdoing one day blocks the way to good adventure in the days following. Have you ever

found this to be true? Tom played ball so hard one Saturday that his muscles hurt when he tried to play the next week. He had strained his muscles. Jack took such a long climb up the mountain the first day

Photo by H. Armstrong Roberts

Avoiding fatigue and strains helps adventure.

at camp that he was stiff and sore for a week. He too had injured his muscles by using them excessively before they had been trained for hard exercise. Big League ball players begin training early.

All the health habits aid adventure. Any of them may make the difference between being ready for outdoor adventure and being ill at home. Give illustrations of this from your own experience.

How an annual health examination helps to make adventure possible. An annual health examination* at the doctor's office or in school is a good beginning to an adventurous year. The doctor will look for nests of bacteria — foci of infection* — in tonsils and nose. If he finds any foci of infection, he will tell you how they should be removed. He will examine your eyes, heart, lungs, teeth, nose, and throat. He will tell you whether you have any physical defects* which should be corrected. Physical defects interfere with the best health possible for you — the kind of health that makes mere living an adventure.

In the health-examination room there is usually a chart with letters of different sizes. To test your eyesight, the doctor or nurse will ask you to read the letters on the chart twenty feet away from you. There are scales to measure your height and weight. Most boys and girls are interested in their health records. They like to see how much they have grown, how much stronger they are, and how much they have gained in other ways during the year.

The doctor may help you to plan a healthful daily

schedule for the fall or winter. In this daily plan you will wish to include three wholesome meals served at about the same time each day, a regular bedtime, about ten hours of sleep, at least two hours out of

An annual health examination helps adventure.

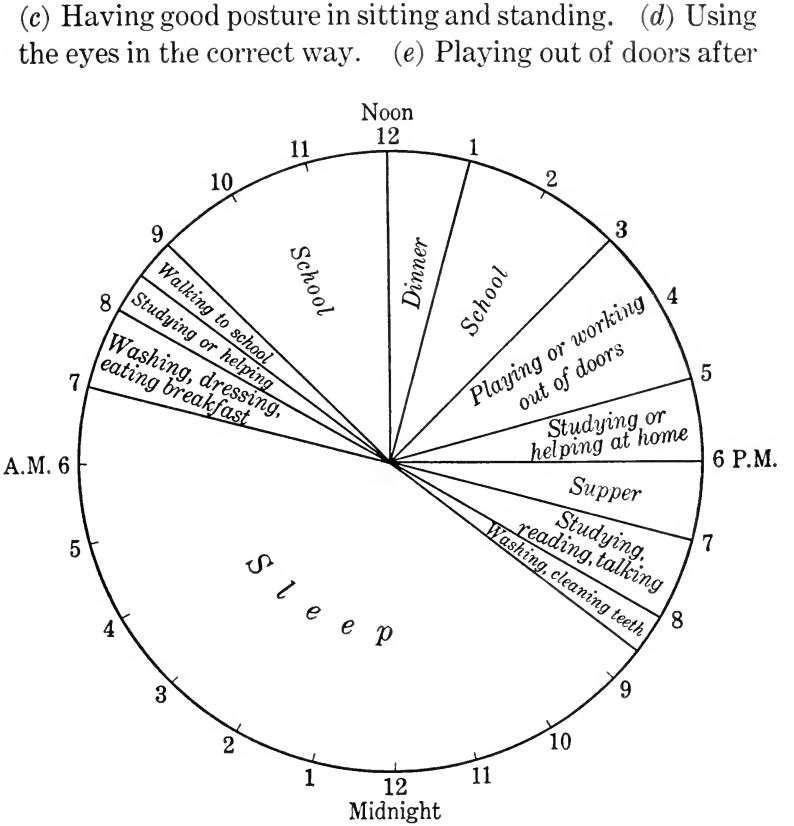
doors, time always to wash your hands and face before eating and to take an allover bath, time to study, time to help your mother and father, time with your family and friends, and time to yourself.

In many schools the health examination of pupils is now a part of school life, just as are examinations in arithmetic, reading, and history.

Things to Do

1. Take stock of your health habits by making a list of the good habits you have already formed. Add to this list other habits which you wish to form this year.
2. "Nothing in excess"* is a rule which many successful people follow. They do not eat too much. They do not exercise too much. What are some of the excesses and strains which you should avoid? Make drawings illustrating some of these things.
3. Draw a circle representing twenty-four hours of a school day. Divide this circle into parts like the pieces of a pie. Each part should show the hours you plan to spend sleeping, eating, bathing and dressing, playing or working outdoors, attending school, studying, helping your father or mother, and just enjoying yourself in various ways, sometimes by doing nothing in particular. Compare it with the clock on the next page.
4. Work with the rest of your class in making a series of posters to show to the children in a lower grade. Think of questions to ask them. Remember that the purpose of the posters is to make the children want to do the healthful things you are telling them about. Try to illustrate the following good habits: (*a*) Eating healthful breakfasts. Give proof that food makes a difference in growth and health and happiness. (*b*) Putting money in the bank

or spending it for fruit or games rather than for candy. (*c*) Having good posture in sitting and standing. (*d*) Using the eyes in the correct way. (*e*) Playing out of doors after



A well-planned day

school. (*f*) Drinking at least four glasses of water a day.

5. In your geography and history books this year read about the health habits of people of other countries and the health conditions under which they live. Compare

the health habits and health conditions of other people with your own. 6. What are some of the things that will make your classroom a pleasant, more attractive place to be in this year? What can you do to help everyone to learn to come to school every day with clean skin, teeth, hair, nails, and clothing?

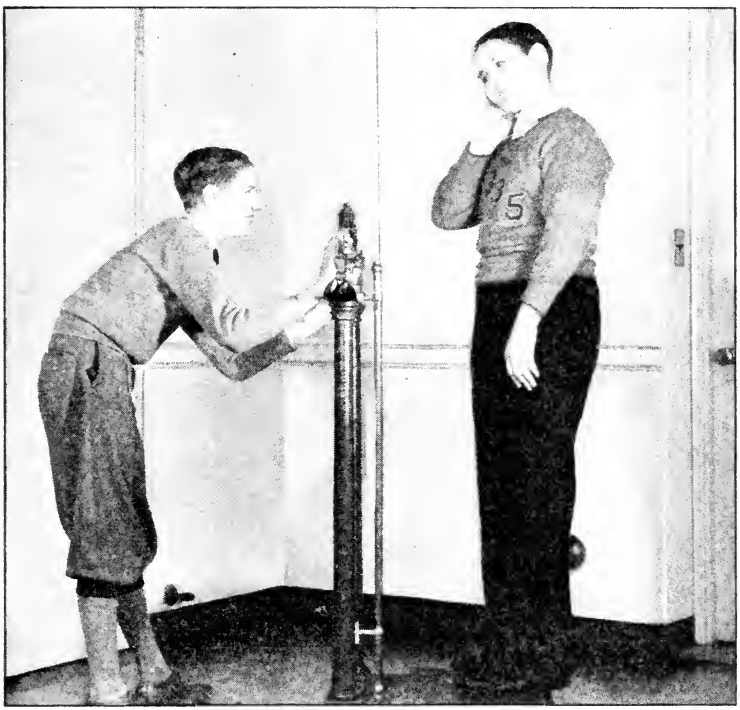
7. There are many facts in this chapter. From a number of facts a person can often draw a general conclusion or principle. For example, if many experiments show that animals and children stop growing and become sick when certain foods are taken from their diet, you could draw the conclusion that certain foods make the difference between growing normally and failing to grow, and between sickness and health; or that certain foods are essential to growth and health. What other conclusions can you draw from the facts in this chapter?

IF YOU ARE TOO FAT OR TOO THIN

Some people think they are too fat. Other people seem to be too thin. Still others seem to have just the right weight for their height and age. After the doctor has made his examination, he can tell better whether the person is really too fat or too thin. He may discover bad habits or conditions which are preventing the best health possible for a boy or girl.

What is the right weight? The most desirable weight for a child at a given age is not known.

Doctors have weighed many thousand boys and girls of different heights and ages. They have added the weights of all the boys of different ages and heights



Check your weight every month.

together and the weight of all the girls of different ages and heights together, and have found the average weight for each group. In the Appendix you will find one of the most useful of the height-

weight tables. You will notice that the heights and weights are given for three types of children. The tall, slender type weighs less in proportion to height than the short, stocky type. It is sometimes hard to decide which is your type. If you are in doubt, you can safely use the figures in the center section of the table. Such tables have been useful in bringing unusual children to the attention of the doctor or nurse. But these tables give only *average* weights. They do not show what is the *best* weight for any individual boy or girl.

A few years ago some girls who were really thin were afraid that they were too fat. They went on reducing diets when they should have eaten more than the average amount of food. As a result, they did not have the reserve energy which they needed.

When One Is Underweight

Must one have average weight in order to be healthy? It is not necessary to weigh as much as the average child of your age and height in order to be healthy. Many children whose weight is below average are healthy. Some children who are underweight according to the average weights of other children may be of a slender body build. It may be natural for them to weigh less than the average child. Many boys and girls above average have just the

right weight for them. The weight of healthy children depends upon the size of their parents and grandparents, the race to which they belong, the climate in which they have lived, and many other factors.

Signs of good nutrition. What are they?

But if you are more than 10 per cent underweight according to the height-weight tables, a careful examination by the doctor may show other signs of poor nutrition,* or *malnutrition** as it is commonly called. Malnutrition means that the cells* of the

body are not being supplied with all the substances they need. Malnutrition may show itself in underweight, poor posture, fatigue, lack of color in the lips and cheeks, flabby* muscles, and dull eyes.

Growth is a more important measure of good nutrition. All healthy young animals and children gain in weight during the year. An average yearly gain in weight for boys ten years old is six pounds; for boys eleven years old, seven pounds; for boys twelve years old, nine pounds; and for boys thirteen years old, eleven pounds. An average yearly gain for girls ten years old is eight pounds; for girls eleven years old, ten pounds; for girls twelve years old, thirteen pounds; and for girls thirteen years old, ten pounds.

What are the causes of underweight? Some boys and girls tend to be thin because their fathers and mothers are thin. Their grandfathers and grandmothers also may have been of a slender body build. They inherit* a tendency* toward thinness. Some children belong to a race of small, slender people. Such people are often quite healthy.

Illness and such physical defects as diseased tonsils,* adenoids,* or decayed teeth are sometimes causes of underweight. Lung, heart, and kidney troubles may result in loss of weight.

Some people worry about everything and get angry

and excited about little things that really do not matter. Worry and other emotional* disturbances such as anger, fear, and disappointment use up energy that might have been used in building the

Did this boy choose a good lunch?

body. Anger and fear tear down; happiness and contentment help to build body cells.

A common cause of malnutrition is eating the wrong kind and amount of food. Sometimes bad

eating habits are due to poorly planned meals; sometimes, to lack of appetite. Some boys and girls take away the appetite for wholesome foods at mealtimes by eating candy and sweets between meals. Others have no appetite because they do not play out of doors or because they do not have enough fresh air night and day.

Some boys and girls fail to gain in weight because they eat too quickly and at irregular times. By doing so they prevent their bodies from making the best use of the food they eat. Some boys and girls do not gain in weight because they exercise too much or keep late hours. Going too often to the movies or to late parties in the evening prevents them from getting enough sleep and rest. Their body cells do not have a good chance to be recharged with energy.

There is no one cause of malnutrition. Any or all of the conditions mentioned may prevent boys or girls from having the best health possible for them.

How can you gain weight? One group of boys and girls asked how they could gain weight during the Christmas vacation. These are the suggestions their teacher gave them:

Every day: (1) Sleep from about eight o'clock at night to about seven the next morning. (2) Stay out of doors at least two hours in the morning and two hours in the afternoon. (3) Eat nothing between

meals unless you are hungry and the doctor tells you this extra lunch is good for you. A midmorning or midafternoon lunch of fruit or crackers and milk is the best kind of lunch to choose. (4) Eat your meals at about the same time each day. (5) Allow at least fifteen minutes for breakfast and half an hour for each of the other two meals. Then you will have time to chew your food well. Mixing food thoroughly with saliva* makes it taste better, helps to dissolve it, and begins the digestion* of starchy foods. (6) Eat three wholesome meals such as the following:

Breakfast

Fruit
A cup of hot cereal with thin cream
Two or three slices of toast or hard rolls with butter
A cup of cocoa or a glass of milk

Dinner

A small portion of meat or fish
One large potato; generous serving of two other vegetables, one of them a green vegetable
Bread or rolls; butter
Fresh fruit, or a milk pudding

Supper

A large dishful of hot cereal, toast, or potato, and milk
A large serving of apple pudding

(7) Be happy. Try not to let anything make you cross or angry or worried. (8) Avoid rich, very sweet, and highly seasoned foods.

These are good general rules to follow throughout the year. The doctor or nurse will be glad to tell

A midmorning lunch of crackers and milk

you the things which are especially important to help you gain in weight.

What are other schools doing to prevent malnutrition? In some schools there are special classes

for malnourished children. The gains some of the children make are extraordinary. In one class a girl gained twenty-two pounds during the year. She was "just skin and bones" when she entered the class. Every day at the noon hour, the boys and girls in these classes are served a hot lunch consisting of green leafy vegetables, fresh fruits, and milk. The following is one lunch which cost only about fifteen cents:

Three-fourths cup of macaroni with eggs
One-half cup of buttered carrots
Five-eighths cup of milk
Two whole-wheat bread sandwiches
One-half cup of vegetable salad
One-half cup of fresh fruit cut into pieces

After lunch the children lie down on cots and sleep or rest for half an hour. After resting they play out of doors for fifteen minutes before returning to their classes. At the beginning of the year the boys and girls in these classes are given a health examination by the doctor. Every Wednesday they are weighed and measured. They try to find out the reasons for their gains or losses in weight.

At home the mothers help these children to get to bed at about eight o'clock every night so that they will have ten to eleven hours of sleep. The mothers encourage the children to play out of doors at least two hours in the sunlight. They give them

milk and some green vegetable or fruit at every meal. They do not give them coffee. They sometimes give them a piece of candy at the end of a meal, but never before or between meals.

A half hour's rest

The teachers and nurses in charge of these classes say that the boys and girls are interested and want to do everything they can to gain in weight. Many of them are on "the royal road to health" at the end of the year. This kind of class would be good for all

boys and girls — not just for those who are undernourished.

When One Is Overweight

What are the causes of overweight? There was once a very fat boy who went to the doctor to find out why he was so fat. The doctor first asked about the food he ate: "What do you have for breakfast?"

"Pancakes and sirup," said the fat boy.

"How many pancakes?"

"Six or seven."

"How big are they? Big as a plate? Big as a saucer?"

"Big as a plate."

"What do you have for lunch?" the doctor then asked.

"Potatoes and sausage and cake and milk."

"How many potatoes?"

"Five or six."

The doctor continued his questions until he found out how much food the fat boy was eating. It was a very large amount of food. In addition to his three meals, the fat boy visited his mother's candy store and — he did not simply look at the candy.

"There's nothing the matter with you," the doctor said, "except that you eat too large an amount of food — and your mother owns a candy store."

Eating too large an amount of food is the chief cause of overweight. In addition to eating a large amount of food, some fat people take very little exercise. The food which they eat is not used up.

A few boys and girls are too fat because certain glands in their bodies are not working properly. *Glands** are organs that secrete* (make and pour out) liquids which are useful to the body. The salivary* glands in the mouth, for example, secrete saliva which helps to digest food. One of the glands which may be related to overweight is the thyroid* gland. You may have seen people with a swelling in the front of the neck due to an enlargement of the thyroid gland.

If the thyroid gland is very active — secretes more than the usual amount — the person tends to use up quickly the food he eats. He does not gain in weight. He may get thinner. If the thyroid gland is lazy — secretes less than the usual amount — the person tends to store much of the food he eats, and gains in weight.

There is another gland called the pituitary* gland which is found at the lower part of the brain. A certain disturbance of either the thyroid gland or the pituitary gland seems to be one cause of overweight in a few cases.

But the majority of fat people are overweight simply because they eat more food than they use. If

the food you eat is not used up in exercise, in the necessary daily work of the body, and in growth, it is likely to be stored as fat.

Are reducing medicine and dieting ever dangerous? In newspapers and magazines you will find a variety of cures for *obesity*.* Many of the get-thin-quick medicines have contained thyroid extract, made from the thyroid glands of sheep. This use of thyroid extract may be extremely dangerous. Thyroid should not be given even by physicians except with great care and close observation of the patient. In many cases these reducing medicines do not cause a loss in weight, and they are often followed by nervousness and other disturbances of bodily processes. Some people who are too fat seem to be willing to do anything to get rid of the excess except to eat a smaller amount of carefully selected foods. One woman who took reducing medicine lost more weight than she wanted to lose. As a result she was under the doctor's care for several months. Other reducing cures consist chiefly of some cathartic.* Why are these, too, harmful?

It is dangerous to lose weight too quickly. The best authorities give this rule: Do not lose more than two pounds a week. Special reducing diets consisting of only one kind of food, such as skimmed milk or grapefruit, are silly and harmful. It is not true that

drinking lemon juice will reduce weight. Eating grapefruit daily in addition to the regular meals will not make one thin. The only safe reducing diet is one that contains all the essential food elements. But the person who is reducing should merely eat smaller amounts of food than he usually does.

How much is "sufficient" milk, vegetables, and fruit? Many times in this chapter the "right amount" of food has been mentioned. What is the "right amount"? How much is "sufficient" milk, vegetables, and fruit?

Sufficient milk, as you know, is in general a quart a day for growing boys and girls and at least a pint a day for every adult — that is, for every grown-up. Sufficient vegetables, one well-known scientist* says, are two kinds of vegetables every day — if possible, two besides potatoes, one of which is a green leafy vegetable. There should also be a serving of a raw green vegetable, such as lettuce, celery, or cabbage. Sufficient fruit is fruit at least once a day — two or three times, if possible.

These three kinds of food are needed whether a person is fat or thin. A thin person needs more food than a fat person of the same age, height, and activity. There is a way of measuring exactly the total amount of food you need each day. You know that length is measured by inches, feet, and other

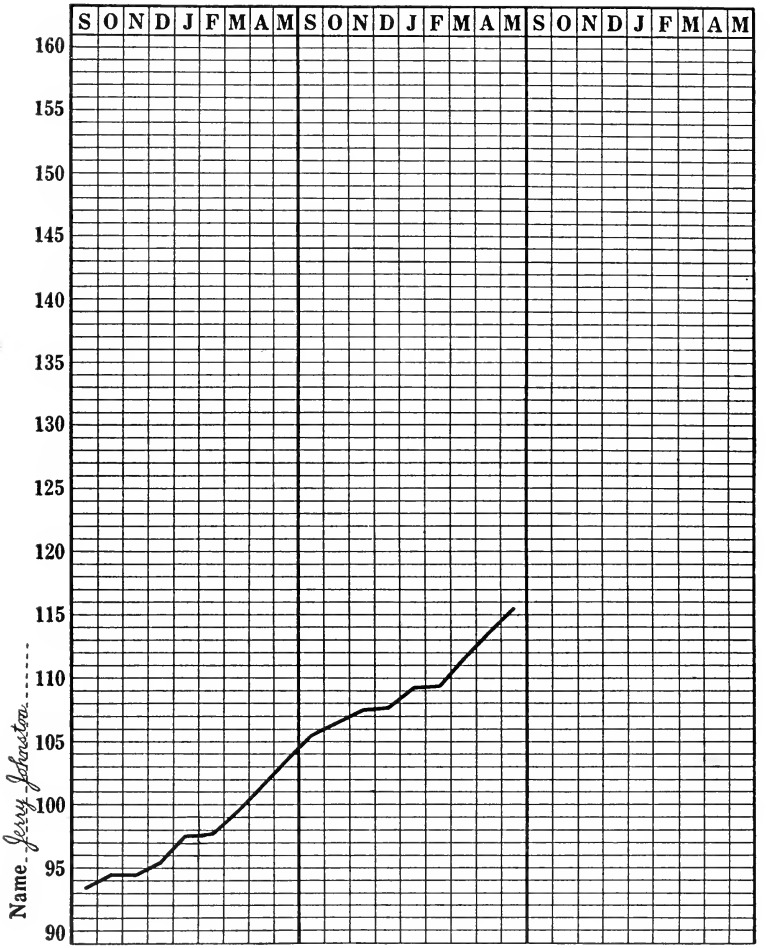
units; that weight is measured by pounds, ounces, and so on; and that volume is measured by pints and gallons. Do you know how the amount of food you need is measured? The unit of measure of the power to work and play that food gives us is called a *calorie*.*

Things to Do

1. Weigh yourself every month. Write down the amount you weigh each month. Notice how much you gain month by month. Make a graph of your weight during the year like that on page 28. Do the same thing for some younger child in whom you are interested. If the child you are weighing is thin and does not gain weight for several months, ask the doctor to give a health examination. **2.** Make a poster showing the things to do to gain in weight if you are too thin. **3.** Help write a class newspaper. In this newspaper write health problems the class is solving, giving the steps in the solution of each problem.

4. Make a scrapbook of the difficult words in this book. Starred words, as you know, are those that are especially useful in a book about health. You will of course look up such words in the Glossary. Be especially careful of *ordinary* words that you do not know.

5. Look in newspapers and magazines for advertisements of ways of reducing weight. Discuss in class whether or not they are safe and scientific. **6.** Look for the word *calorie* in books, magazines, and newspapers;



A good weight graph

How many pounds did Jerry gain the first year? The second year?

bring to class copied sentences and paragraphs or clippings in which *calorie* occurs. Read and discuss your findings. 7. Write the conclusions you can draw from the facts in this chapter.

ENERGY FOR EXERCISE

Moderate outdoor work or play suited to your needs may be very pleasant and very healthful. Fresh air and sunlight on the bare skin are the best kind of tonic. All energy for playing, working, or exercising in any way comes, in the first place, from the sun. But our direct source of energy is our food.

What kinds of exercise do you take? Before school in the morning do you go to the store, sell papers, make your bed, go for a run with the dog, play ball, bring in wood, milk the cows, deliver milk, or walk part or all the way to school? All these activities require energy. At recess time do you play group games out of doors? This is an excellent way to spend recess. Playing such games as baseball requires energy. At noontime do you walk briskly home to lunch and walk slowly back to school after lunch? Or do you have lunch at school and play certain quieter games in the sunshine when you have finished eating? Such games are best after eating. They require energy, too, but not so much as the more active games.

After school do you play out of doors? Perhaps you change your clothes first. What do you play — handball, football, dodge ball, basketball, baseball, deck tennis, volley ball, or others of the more active games? Or do you go for a walk in a park or in the woods? Perhaps you spend the afternoon roller skating in the fall and spring and ice skating and sleigh riding in the winter time. Do you spend part of the afternoon working on the farm, cleaning the house, cutting wood, or going to the store? These are healthful ways to spend time after school.

Saturday is the best day for outdoor play. Every season brings its special gift of games and sports. What are the summer sports? The winter sports? The games of fall and spring? A recipe for a healthful Saturday may include at least two hours of work, two to four hours of play, two hours of rest.

All activities require energy.

Where do you get the power to work and play? The body is a working machine. It needs fuel to keep it running. Its fuel is food. When you eat, the food is changed in the digestive tract. It is carried by the blood to the body cells. Some of it is packed away in the cells to be used as needed. Some of it is burned at once. As the food burns in the body cells, it furnishes power to move. The faster we move, the more fuel is used. The food we eat

works like the fuel used in an automobile or in an airplane engine. But there is this difference: An engine stops working at times; the body never stops working as long as one lives even when we rest.

Photo by H. Armstrong Roberts

Heat is a sign that food is being used as fuel. You have noticed, of course, how warm you become when you exercise. Even on a cold winter's day you feel warm after you have been skating or running a few minutes.

How much food is needed for different activities? Most people eat according to their appetites, and appetite is often right. You are usually hungry after you have been swimming or skating. Both these sports use up a good deal of fuel. People who work hard out of doors usually have a larger appetite than people who do indoor work. In this case also appetite is right. But appetite does not tell you everything about food you need. Appetite did not tell the thin child who had nothing but coffee for breakfast that he should eat cereal and milk and fruit.

What Calories Tell Us

Appetite usually tells you the amount of food you need. But when bad food habits have been formed, appetite often fails to tell you how much you should eat. So while appetite is a pretty safe guide to the amount of daily food needed, it is fortunate that there is a more exact way of knowing how much food you should eat. It is by measuring (*a*) the calories you use in your daily work and play, and (*b*) the calories in different foods. Have you ever heard your family talk about calories? How many times did you find the word *calorie* in newspapers or magazines?

Read carefully the table on pages 34–35. Try to answer the questions below the table. Study the first six activities on the list. How do you explain

the increase in the number of calories needed from sleeping to standing at attention as soldiers do?

Why do you need any calories when you are sleeping? What activity is going on even when you are asleep? Yes, the heart is beating. The lungs are being filled with air and partly emptied many times a minute. Records of sleeping children have shown that they move their hands, legs, and other parts of the body from time to time.

Photo by H. Armstrong Roberts

The more vigorous the movements, the more calories are needed.

Every movement requires food. Calories are spent every time a movement is made. The more vigorous the

movements, the more calories are needed. You need a few more calories when you are lying awake than when you are sleeping; more when you are sitting than when you are lying down; and more when you are standing than when you are sitting. You need most calories when you are running fast, skating, swimming, playing baseball, cleaning house, or splitting wood. The more active you are, the more calories you need. The number of calories a person needs depends on how active he is.

CALORIES USED PER HOUR WHEN DOING DIFFERENT KINDS OF MUSCULAR* WORK

Form of Activity	*Calories per Pound per Hour*
Sleeping	0.43
Awake, lying still	0.50
Sitting at rest	0.65
Reading aloud or studying	0.69
Standing relaxed	0.69
Standing at attention, as soldiers sometimes do	0.74
Dressing and undressing	0.81
Singing	0.89
Typewriting rapidly	0.91
Light exercise, such as washing dishes	1.10
Shoemaking	1.10
Walking (2.6 miles per hour)	1.30
Carpentry, metal working	1.56
Active exercise, such as playing baseball or roller skating	1.88

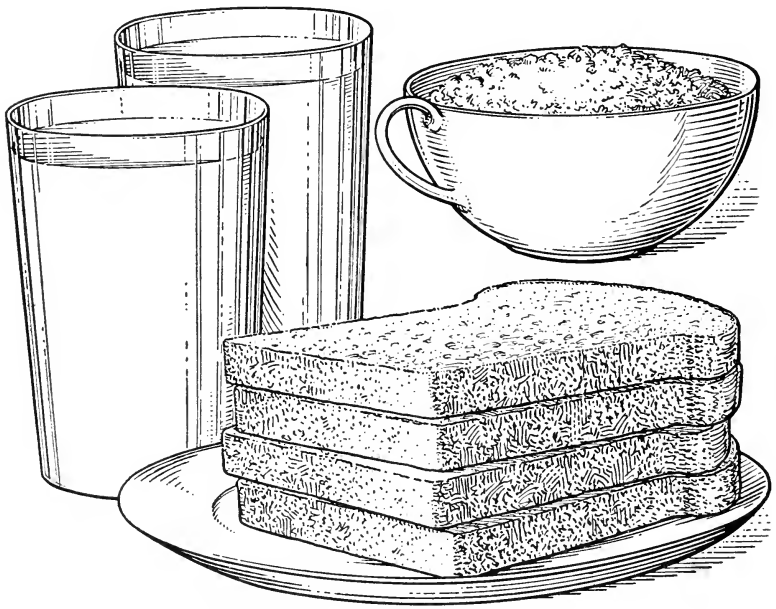
Form of Activity	*Calories per Pound per Hour*
Walking (3.75 miles per hour)	1.95
Severe exercise, such as handball and lively folk dances	2.92
Sawing wood	3.12
Swimming	3.25
Running (5.3 miles per hour)	3.70
Very severe exercise, such as climbing a steep mountain rapidly	3.90

Which activities require the smallest number of calories? Which require the largest number? How many times as many calories do you need when you are swimming as when you are studying? Which exercise takes the most energy? Does running or walking use up more calories? Does it take many calories to study hard? Does swimming require more energy than washing dishes? Some of these activities may make you more tired than others, even though they do not require as many calories. This is because they use certain muscles almost all the time, while other activities use so many muscles that some have a chance to rest while others are working. For this reason, it would be easier for a person to build a house five hours at a time than to sing steadily for five hours. But more calories would be spent in the five hours of carpentry.

Using Our Knowledge of Calories

How can you use your knowledge of calories? If you are thirteen years old and need about 2400

calories a day, you can build three meals which furnish this number of calories. Suppose you decide to have 700 calories for breakfast, 800 calories for lunch, and 900 calories for dinner.



A breakfast of about 700 calories

One slice of baker's bread an inch thick will yield 100 calories. A glass of milk filled to within one-quarter inch of the top will give you 160 calories. If you had nothing but whole-wheat bread and milk for breakfast, how much of each would you need? Two glasses of milk and about eight one-half-inch slices of

bread would count up to 700 calories. Your breakfast would then consist of:

2 glasses of milk	320 calories
8 slices of bread one-half inch thick .	400 calories
	720 calories

Two thirds of a five-cent box of graham* crackers may be used in place of the bread. One-half cup of thick oatmeal yields about the same number of calories as a one-inch slice of bread. You could replace two slices of bread with one cup of oatmeal. One level tablespoonful of butter yields 100 calories. You might replace one-half glass of milk by one-half tablespoonful of butter. What would your breakfast then be?

Your lunch or supper could be built in a way similar to the breakfast. The bread might be toasted, more butter added, the milk heated, and fruit added. Then your supper or lunch would consist of:

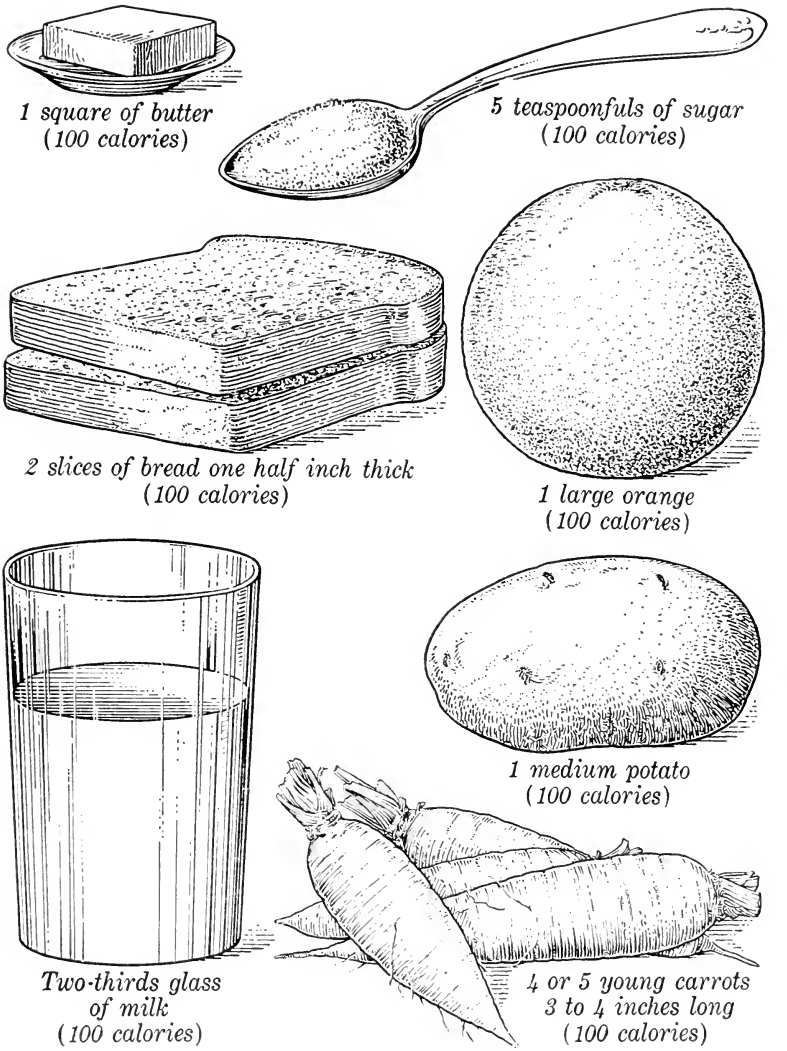
Milk toast	
4 one-half-inch slices of bread . . .	200 calories
$1\frac{1}{2}$ tablespoonfuls of butter	150 calories
$1\frac{1}{2}$ cups of milk	240 calories
Applesauce, $\frac{3}{4}$ cup	200 calories
	790 calories

You could build a dinner in the same way. One large potato yields about 200 calories; a piece of fish,

100 calories; a dish of lettuce (5 calories), served with fruit juice and a tablespoonful of olive oil, a total of 105 calories; one-half cup of chopped spinach, 20 calories. One glass of milk could be used to make a cup custard yielding about 200 calories. Your dinner would then consist of:

2 one-half-inch slices of bread	100 calories
2 tablespoonfuls of butter	200 calories
A piece of fish or meat	100 calories
1 medium baked potato	100 calories
½ cup of chopped spinach	20 calories
A dish of lettuce with fruit juice and 1 tablespoonful of olive oil on the salad	105 calories
A large dish of custard	200 calories
A small cooky	75 calories
	900 calories

These three meals add up to 2410 calories. Some people like to have each meal about the same size. Other people have their largest meal in the middle of the day — 600 calories for breakfast, 1000 for dinner, and 800 for supper. The best plan is to have a good share of the total number of calories in each meal. Then you will not eat too large an amount in one meal or become hungry and eat between meals. Some fat people who eat very little at meals nibble on candy and other sweets between meals. Candy is so high



One-hundred-calorie portions

in calories that they often eat more than their calorie requirement, although they think they are dieting.

Photo by J. C. Allen & Son

Which person in the pictures in this chapter is using the fewest calories?

If your mother or father or older sister is overweight, it may be well to look on your list and find the foods which furnish fewer calories and which fit the case. To build a pound of body fat requires about 4000 calories. If a person reduces his diet by about 1300 calories, he will probably lose about a quarter of a pound a day.

How many calories are in the food you eat? Many boys and girls have been interested in learning the number of calories in the food they eat. The list of

foods on the following pages will tell you the number of calories in some of the common foods. You will notice that some foods are very rich in calories. It takes only one or two tablespoonfuls of these foods to yield 100 calories. Find a food of which you need only one tablespoonful in order to get 100 calories. Find other foods almost as high in calories. Other foods furnish a medium number of calories. One-fourth to one-half cup of these foods yield 100 calories. Find some of the foods on your list which are moderately high in calories. Still other foods yield very few calories. You have to eat two cups or more of these foods in order to get 100 calories. Find a food on the list of which you need a very large dishful to yield 100 calories. Find other foods on the list which are low in calories. Many foods low in calories are high in other food values.

In the following list, the foods are arranged roughly in order from those which have the largest number of calories to those which have the smallest number.

Fats and Sweets	*Amount of the Food Needed to Furnish 100 Calories*[1]
Peanut butter	1 tablespoonful (scant)
Olive oil	1 tablespoonful
Mayonnaise dressing	1 tablespoonful

[1] These figures are taken from Mary Swartz Rose, *Feeding the Family*, pages 349–383. The Macmillan Company, 1929. You can find the number of calories in many other foods in that book.

Fats and Sweets	*Amount of the Food Needed to Furnish 100 Calories*
Butter	1 tablespoonful
Sweet milk chocolate	a piece $2\frac{1}{4} \times 1 \times \frac{1}{8}$ inches
American cheese	$1\frac{1}{8}$-inch cube
Cream (thick)	$1\frac{2}{3}$ tablespoonfuls
Cream cheese	piece $2 \times 1 \times \frac{3}{8}$ inches
Molasses	$1\frac{1}{2}$ tablespoonfuls
Sugar, granulated	2 tablespoonfuls (scant)
Meat and Fish	
Hamburg steak (broiled)	1 cake $2\frac{1}{2}$ inches across, $\frac{7}{8}$ inch thick
Beef, round, lean, pot roast	1 slice $4\frac{3}{4} \times 3\frac{1}{2} \times \frac{1}{8}$ inches
Eggs in shell	$1\frac{1}{3}$ eggs
Chicken meat, without bones	$\frac{1}{4}$ cup
Cooked bacon	4–5 small slices
Fish (halibut steak)	piece $3 \times 1\frac{1}{4} \times 1$ inches
Cereals and Bread	
White flour, sifted	4 tablespoonfuls
Oatmeal	
uncooked	$\frac{1}{4}$ cup
cooked	$\frac{1}{2}$ to $\frac{3}{4}$ cup
White bread	2 slices $3 \times 3\frac{1}{2} \times \frac{1}{2}$ inches
Rolls, French	1 medium roll
Graham crackers	$2\frac{1}{2}$ crackers $2\frac{1}{2} \times 2\frac{3}{4} \times \frac{1}{4}$ inches
Macaroni and cheese	$\frac{1}{2}$ cup
Puffed rice	$1\frac{1}{3}$ cups

Miscellaneous Foods	*Amount of the Food Needed to Furnish 100 Calories*
Cottage cheese	5 tablespoonfuls
Baked beans	$\frac{1}{3}$ cup
Cup custard	$\frac{1}{3}$ cup
Ice cream	$\frac{1}{4}$ cup
Cocoa made with milk	$\frac{1}{2}$ cup (scant)
Baked apple	$\frac{1}{2}$ large apple
Apple pie	piece $1\frac{1}{2}$ inches at circumference (Pie is 9 inches across. One sixth of a pie 9 inches across yields about 300 calories.)
Prunes, dried	4 medium prunes
Milk	
Whole milk	$\frac{5}{8}$ cup
Buttermilk	$1\frac{1}{8}$ cups
Fruits	
Apple, raw	1 large apple
Orange, whole	1 large orange
Orange juice	1 cup
Blackberries, fresh	$\frac{1}{2}$ cup
Banana	1 medium banana
Peaches, fresh	3 medium
Concord grapes	1 large bunch
Vegetables	
White potatoes	1 medium potato
Peas, cooked	$\frac{3}{4}$ cup
Carrots	4–5 young, 3–4 inches long

Vegetables	*Amount of the Food Needed to Furnish 100 Calories*
Asparagus, fresh	20 large stalks, 8 inches long
Tomatoes, canned	2 cups (scant)
Tomatoes, fresh	2–3 medium
Celery	4 cups of $\frac{1}{4}$-inch pieces
Lettuce	2 large heads

All real foods furnish some calories. Coffee and tea without milk or sugar yield no calories. They are not foods. A lunch of two large cheese or egg sandwiches, a glass of milk, and an apple or other fruit furnishes about 700–800 calories. This is an average amount of food for the lunch of a boy or girl of your age.

Things to Do

1. Continue to look for information about calories in newspapers and magazines and bring the clippings you find to school. Share your findings with the class. 2. Make a calorie exhibit. Measure carefully the amount of each food given in the list. Arrange the foods on a table. Put the foods having the largest number of calories at one end of the table and the foods having the smallest number of calories at the other end of the table. After the exhibit arrange these foods in a series of breakfasts, dinners, and suppers. Build first the cheapest, most simple breakfast, dinner, and supper which will give you the kind of food and the number of calories you need. Then add a greater variety of foods. If you cannot bring

the real foods to school, make an exhibit, using pictures of food. Your teacher will tell you where you can get pictures of foods yielding definite amounts of calories.

3. From the following luncheon menu,* choose a lunch that has about 800 calories and is also a lunch which you would like to eat:

LUNCHEON MENU

Cream of asparagus soup	200 calories
1 roll	100 calories
1 square of butter	50 calories
Bottle of milk	160 calories
Fruit salad	200 calories
Peas	50 calories
½ cup of spinach	25 calories
Potato	100 calories
Lamb chop	150 calories
Beets	50 calories
Cooky	75 calories
3 graham crackers	100 calories
Hot chocolate	150 calories
Baked apple	200 calories
Stewed apricots	100 calories
Ice cream	200 calories
Chocolate layer cake	200 calories
Banana	100 calories
Orange	75 calories
Apple	100 calories
Popcorn roll	25 calories

4. When is it all right to drink water with your meals?

5. Were you ever at a picnic at which people ate too

much food? Think of ways in which overeating at picnics may be avoided. **6.** Does your daily schedule include at least one and a half hours of work or play out of doors? **7.** Get from the library a book of games that will tell you how to play them. You can try out new games.

8. Talk about calories with your family. **9.** With the help of your physical-education teacher test your strength and skill near the beginning of the year and again near the end of the year.

10. Make a poster showing one important way to increase health and strength. Have an exhibit of the posters made by all the boys and girls in your class. **11.** Think of some people you know very well. Think of the kind of work each does. Decide which of these people would probably need the largest number of calories. **12.** Where do the woodchuck and bear which sleep during the winter get the energy to keep them alive until spring? **13.** Answer the following questions and prove your answers from the table on pages 34–35. Who will need the larger number of calories if the two people who are compared in each case have the same height, age, and weight and spend the rest of the day in the same way:

A man who works as clerk in a store, or a farmer?

A woman who does her own housework, or a woman who sits at an office desk all day?

A woman who sews, or a woman who washes and irons clothes for her living?

A girl who is athletic and plays many kinds of outdoor games, or a girl who likes indoor amusements best?

A boy who is in training on the football or baseball team, or a boy who spends his free time reading and going to the motion pictures?

A storekeeper, or a day laborer?

A girl who walks to school, or one who rides to school?

14. Keep a record for a week of the number of minutes you spend out of doors in the sunshine. Discuss your record in class. **15.** What conclusions can you draw from the facts in this chapter? Write them.

FOOD SUBSTANCES WHICH SUPPLY CALORIES

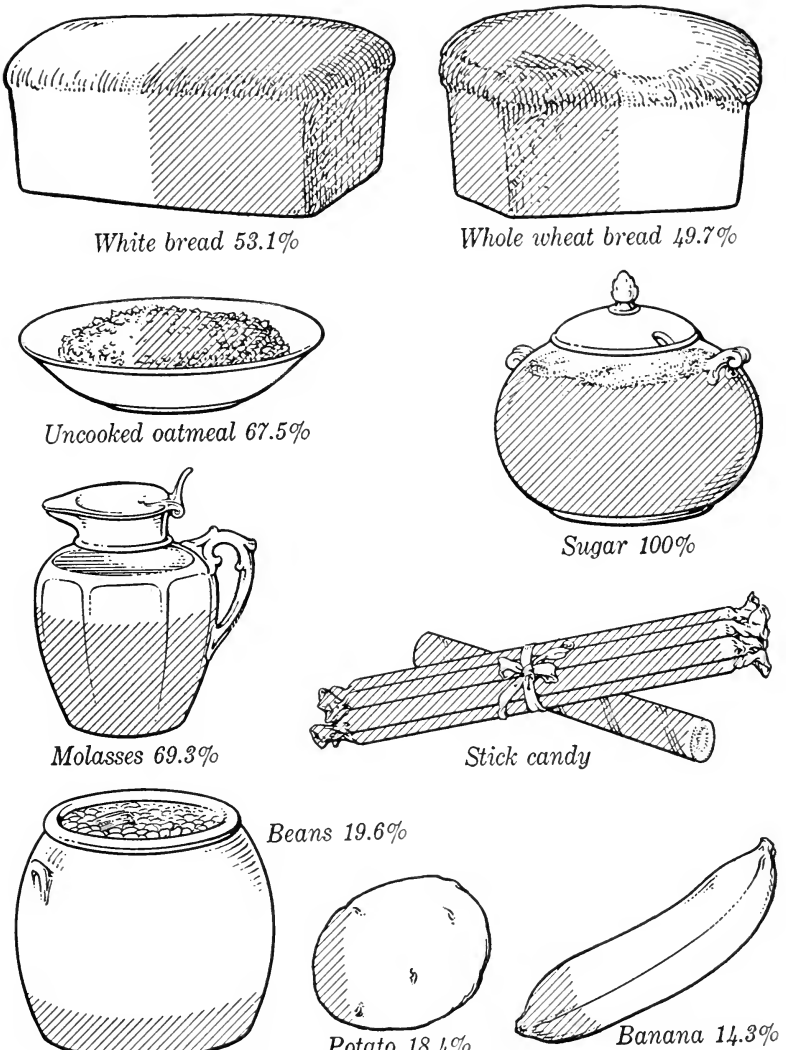
People all over the world need energy for their activities. Energy, which is measured by calories, is supplied by fuel foods. There are calories in all foods; but people in different countries get their fuel from various combinations of food. The Eskimo in the cold North eats several times as much meat as most people in warmer countries. An active young Eskimo may eat as much as nine pounds of seal meat a day when it is easy to get. An Eskimo boy is as likely to eat two pounds of meat a day as an American boy is to eat two ounces. In parts of India, Japan, and China, on the other hand, very little meat is eaten by the majority of people. They get their power to work largely from rice and fish. In warm countries vegetables, fruits, and grains are so

plentiful and cheap that they are used to furnish energy. Soldiers in active service use a different kind of fuel mixture from people who work indoors. The soldiers in the World War often had hot cereal and milk for breakfast and a meat stew for dinner. Some mountain climbers get energy for steep climbs from milk chocolate. Indoor workers can get the energy they need from milk, bread, vegetables, and fruit.

Most people in the United States use mixed fuel. They get their power for work and play from cereals, bread, milk, meat, and other kinds of food. A mixture of substances in foods is the best source of power for people who live in temperate climates.

Which food do you eat most often? Some of you will say *bread.* Bread, as you know, is made of flour. Mix a heaping tablespoonful of flour with a little water until you have a ball of dough; then put the ball of dough in a piece of cheesecloth and squeeze it in a cup of water. In the cheesecloth bag you will find a tough, grayish substance. In the bottom of the cup, after a few minutes, you will find a white powder.

Carbohydrates. You have seen the white powder before if you have made cornstarch pudding or have starched clothes. The white powder is starch. Ask your mother for a tablespoonful of cornstarch. Pick up a pinch of it in your fingers. How does it feel? Mix a little of it with cold water. Put



Best sources of carbohydrates in food

The shaded parts show the percentage of carbohydrates. Which of these foods are richest in carbohydrates?

it on the stove to boil. What happens? Make a list of the facts you found out about starch. Starch is a carbohydrate.* Can you guess from the name *carbohydrate* two of the elements of which starch is made? Carbon* and hydrogen.* That is correct. But carbohydrates are made of three elements — carbon, hydrogen, and oxygen.* C stands for carbon; H, for hydrogen; and O, for oxygen. There are usually two parts of hydrogen and one part of oxygen, as in water — H_2O.

Carbohydrates, such as starch, are formed in the green parts of plants from the carbon dioxide* of the air under the influence of the sun's rays. Some of the foods richest in carbohydrates are cereals, bread, macaroni, potatoes, bananas, dried beans, sugar, and sirups. Some of the carbohydrates, such as potatoes, cereals, and beans, are the cheapest source of calories. Why are carbohydrates often called *fuel foods?*

Proteins. Do you remember the other substance you found in flour — the tough, grayish substance in the cheesecloth bag? That substance is called *protein.** You cannot guess from the name the elements of which proteins are made. Proteins, like carbohydrates, are built of carbon, hydrogen, and oxygen. But, in addition, there is another very important element in proteins which is not in carbohydrates. It is nitrogen.* Some proteins contain sulphur also. You

can easily see the difference between carbohydrates and proteins:

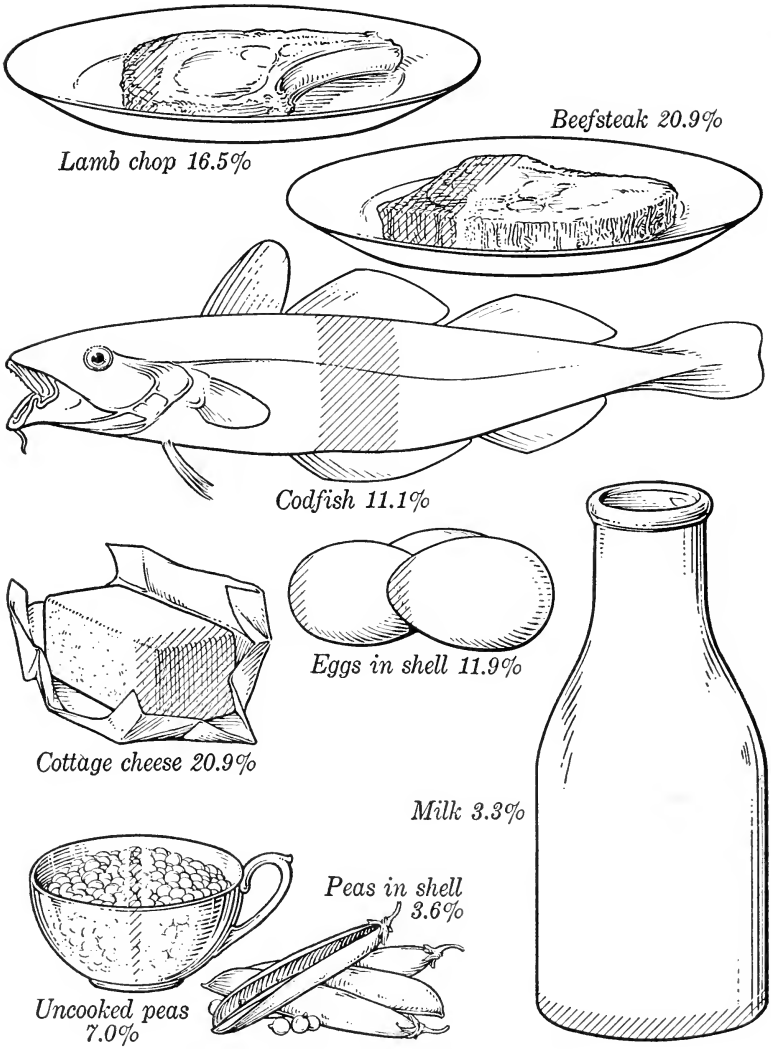
Carbohydrates: carbon, hydrogen, oxygen
Proteins: carbon, hydrogen, oxygen, nitrogen

Why would you expect proteins, like carbohydrates, to supply energy?

Best sources of proteins. The best sources of proteins are milk, eggs, meat, fish, cheese, bread and cereals, peas, beans, and lentils. White of egg, which is chiefly albumen,* is practically pure protein. Study the following figures which show the amount of proteins in some of our common foods:

Food	*Approximate Number of Grams* of Protein*
Milk, 1 glass	8
Beef, medium fat, $\frac{1}{4}$ lb.	22
Bread, 1 small slice	2
Potatoes, 1 medium-sized	$2\frac{1}{2}$
Egg, 1	$6\frac{1}{3}$
Oatmeal, cooked, $\frac{3}{4}$ cup	4
Peas, fresh, $\frac{3}{4}$ cup	7
Cheese, $1\frac{1}{8}$-inch cube	$6\frac{1}{2}$

These are average servings. In which serving would you get the largest amount of proteins? How many slices of bread would you have to eat in order to get as much protein as you would get from one glass of



Best sources of proteins in foods

The shaded parts show the percentage of proteins. Which of these foods are richest in proteins?

milk? One quart of milk supplies as much protein as each of the following foods: 6 ounces of round steak, 4.3 eggs, or $8\frac{1}{2}$ ounces of chicken.

One quart of milk yields about 680 calories. Almost the same amount of energy would be supplied by 10 eggs, 14 slices of white bread one-half inch thick, or $4\frac{1}{2}$ slices of beef three-fourths inch thick and two and one-half inches square (a little more than a pound of lean round steak). Find the cost of each of these three foods. Which is the cheapest source of energy? If you were planning a day's food for a very poor family and for a family which had plenty of money to spend for food, in which diet would you use the larger percentage of calories from carbohydrate foods? Why?

Fats. Everyone knows what fat is. That is not a new name to you, as perhaps proteins and carbohydrates were. Fats and carbohydrates are both made from the same three elements — carbon, hydrogen, and oxygen. Notice the ways in which carbohydrates, fats, and proteins are alike:

Carbohydrates:	carbon, hydrogen, oxygen
Fats:	carbon, hydrogen, oxygen
Proteins:	carbon, hydrogen, oxygen, nitrogen

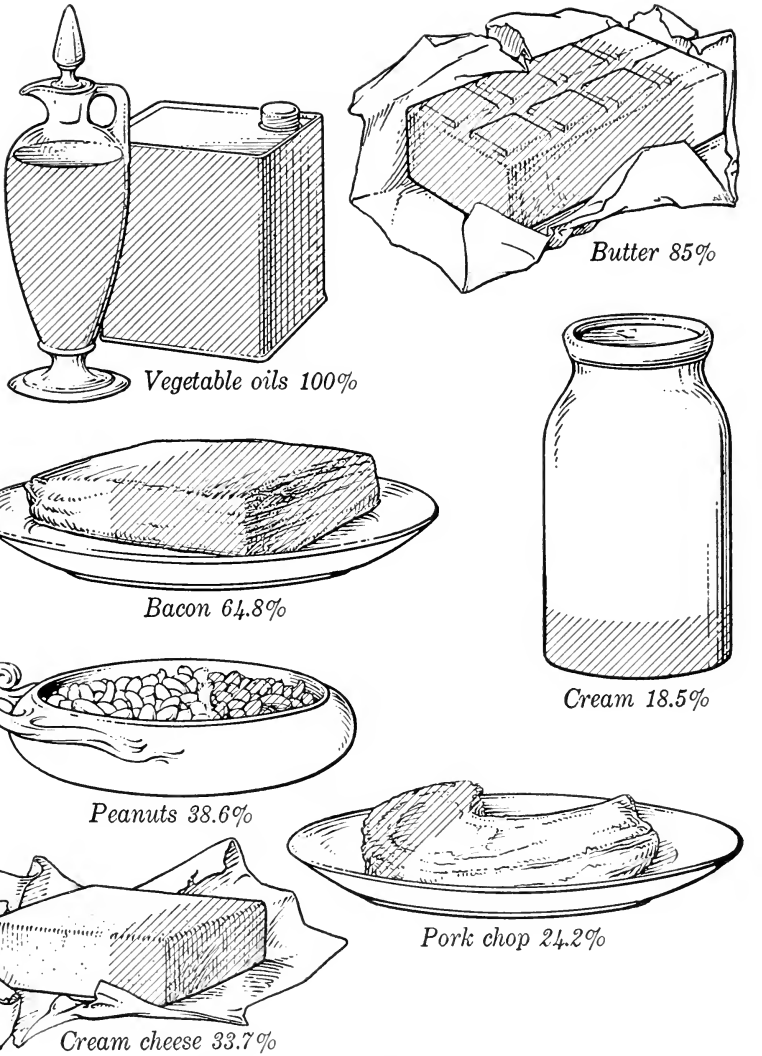
But these elements are present in different amounts, so that fats and carbohydrates are different in appear-

ance, taste, and food value. This is true of many other substances. Carbon dioxide and carbon monoxide,* for example, both contain carbon and oxygen. But the first contains one part of carbon to two parts of oxygen (CO_2), while carbon monoxide contains one part of each element (CO). Carbon dioxide is necessary for life. We breathe it in and out all the time. Carbon monoxide is a very poisonous gas.

Why is fat needed? You would expect fats, like carbohydrates, to furnish energy. And they do. Fats supply twice as much energy per gram as carbohydrates. Fats and carbohydrates are the cheapest and best sources of calories. Fats form the fatty tissues of the body lying under the skin, between the muscles, and around the organs of the digestive system. Fats also form part of all the cells of the body. As much as 96 per cent of the marrow* of the bones may consist of fats.

Best sources of fat. You know the common sources of fats — butter, cream, olive oil and other vegetable oils, nuts, and the fat of meat. Almost everyone likes a little butter on his bread and potatoes.

Some foods are very rich in both fat and protein. These foods are nuts, cheese, fat meat, and fat fish. It is best to have only a small amount of these foods in a meal, because they digest more slowly than the



Best sources of fats in foods

The shaded parts show the percentage of fats. Which of these foods are richest in fats?

other foods. They are sometimes called rich or "heavy" foods.

Things to Do

1. Study the food charts on pages 49, 52, and 55. Which foods contain the largest amount of carbohydrates? Proteins? Fats? From which foods do you get most of your proteins? Carbohydrates? Fats? Why is bread a better source of carbohydrate than candy? 2. Make an exhibit of the foods richest in carbohydrates, fats, and proteins. If you cannot bring the real foods to school, use colored pictures. 3. Tell your mother as much of this chapter as you can remember sometime when you are talking with her at mealtime or while you are drying the dishes.

4. If you go to a rural school where it is possible to cook, help the teacher prepare the hot dish for lunch time.

BUILDING BLOCKS OF THE BODY

Plant Cells

The plants you see every day are built of many cells. Each cell has in the center a thickened, or concentrated,* bit of *protoplasm.** This is the nucleus.* Another part of the protoplasm manufactures food for the rest of the cell.

Plants are like people in many ways. They must have light, certain temperatures, water, oxygen, and various food materials. The life of plants is affected

by other plants and by animals, just as our lives are affected by the people we meet.

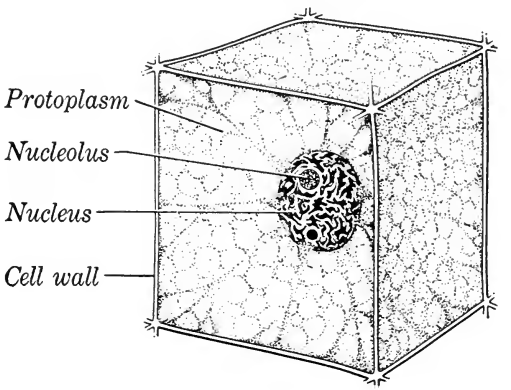
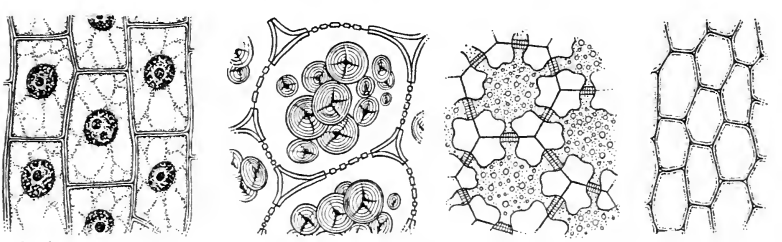


Diagram of a cell

Sunlight may be thought of as a source of all life. Green plants cannot live all the time in the dark. They do not manufacture food in the dark night.



Plant cells, greatly magnified

The heat of too strong sunlight causes the leaves of shade plants to wither. They cannot draw water from the soil as fast as the sun evaporates it from the

leaves. This is the reason why a field of corn wilts after a few days of very hot, dry weather. The best temperature for most plants and animals lies between 68° F. and 85° F.

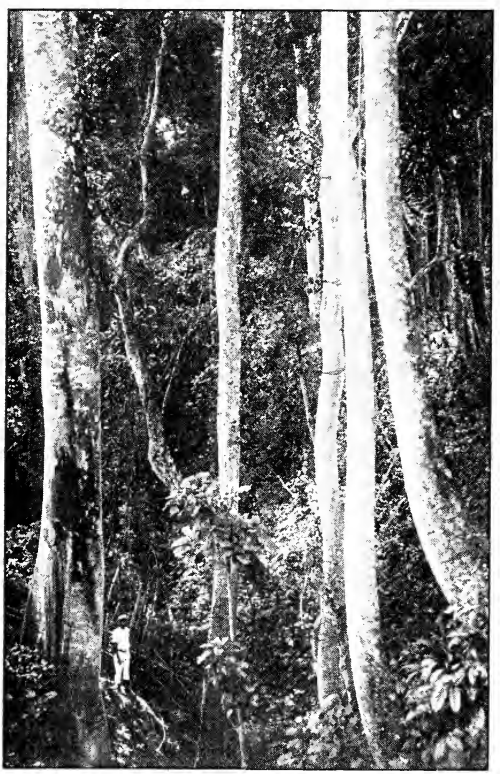


Photo by Ewing Galloway

Plants in a tropical forest

Protoplasm is the life substance of the plant, and protoplasm is chiefly water. About eighty to ninety per cent of protoplasm is water. No wonder plants must have water! The kind of plants growing in different places depends chiefly on the water supply. What kind of plants grow in the desert? What kind of plants grow in the wet tropical forests? Plants seldom die because of lack of carbon dioxide. Yet

nearly one half of the total weight of plants, after the water has been evaporated, is a compound of carbon dioxide. The plants get their carbon dioxide from

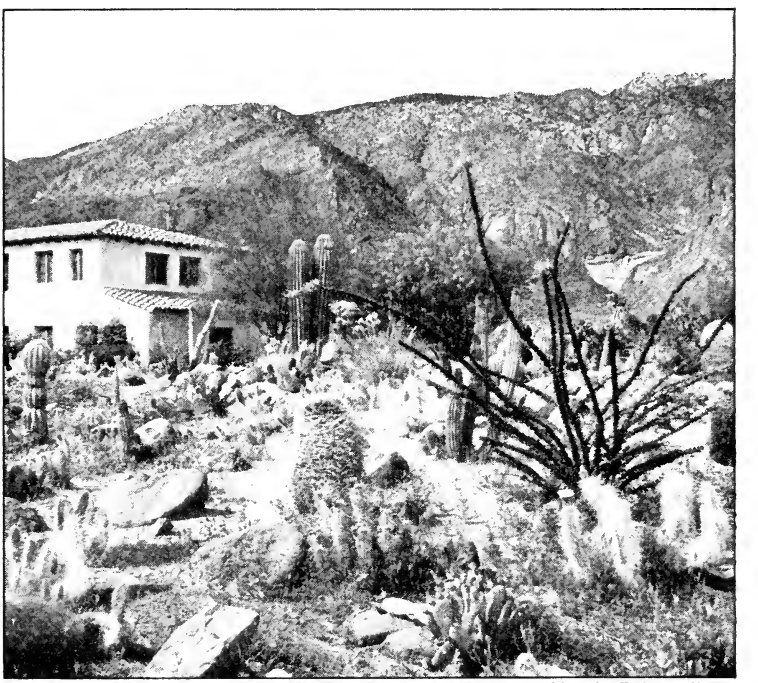


Photo by Ewing Galloway

Plants that grow in the desert

the air; and the small amount of carbon dioxide in the air seems to be quite enough.

Oxygen, like carbon dioxide, is very important in plant life; but there is usually plenty of this gas in the air. Plants obtain nitrogen (another gas) in

a roundabout way. Although four fifths of the atmosphere is nitrogen, plants must get their nitrogen through the roots. Friendly bacteria prepare nitrogen in a form which plants can use. Mineral* salts are also brought up from the soil by the roots of plants. Man and animals, in turn, get the minerals they need largely from plants.

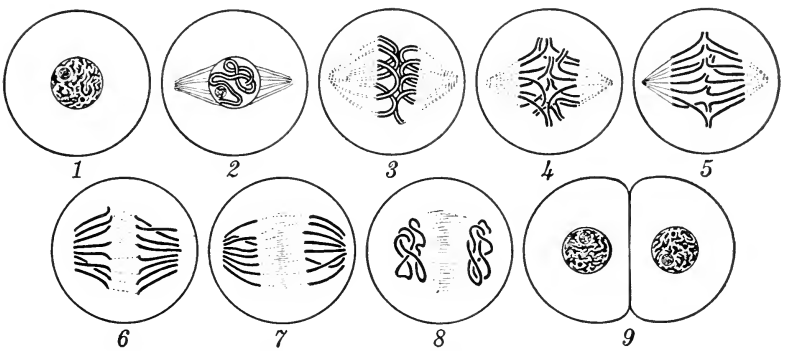
Animal Cells

This is, briefly, the story of plant life from which we get so much of our food. Animal life has a similar story. Light, warmth, water, oxygen, and food are needed. The animals one commonly sees are many-celled, but there are microscopic* one-celled animals also. Human beings are, of course, many-celled. Cells grow and divide to form new cells. We are building many kinds of body cells throughout life.

People often say: "You should eat to keep up your strength," and "This food is strengthening." You have learned in the chapter on energy that the strength- or energy-giving power of food is measured by calories. You have also learned that some foods furnish more power to work and play than other foods. In other words, some foods are high in calories and others are low in calories. Butter is very high in calories; celery is very low in calories. Turn to pages 41–44 and find the foods which are highest

in calories. Do you know what happens if you eat more calories than you use up in muscular work and play? Find the answer to this question on page 24.

Everyone wishes to be strong. Strength is not merely a matter of calories. In addition to the power



Cell division: The beginning of new cells

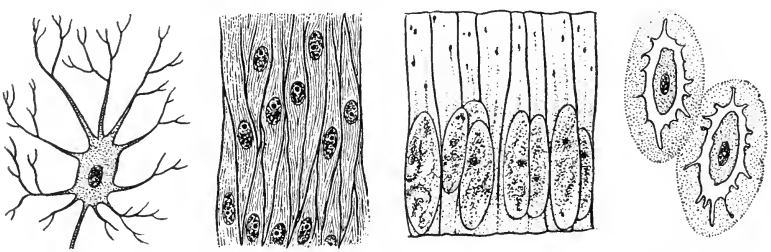
which calories furnish, you need well-built bones and muscles obedient to your commands. Food is needed to build the body as well as to supply it with the energy needed to keep it going.

Building the Body

What are the building blocks of the body? Your muscles, bones, blood, and other parts of the body are built of billions of tiny living cells. Muscles grow bigger as the number of muscle cells becomes greater. Bones and other parts of the body grow in the same

way. Groups of the same kind of cells are called *tissues.** The tissues with which you are most familiar are bone tissue, muscular tissue, and nervous tissue.

Some tissues are combined to form organs. The heart is an *organ.** The lungs, stomach, intestines, liver, and eyes are all organs. Each organ does a



Nerve cell *Muscle cells* *Epithelial* cells* *Bone cells*

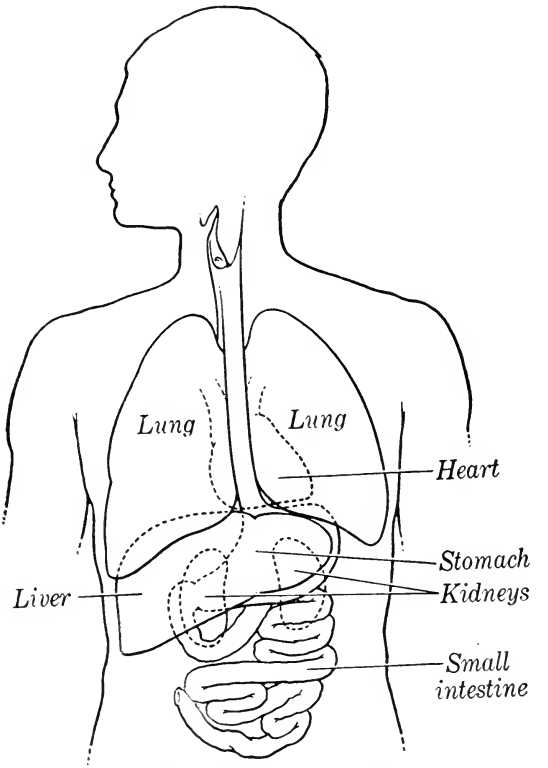
Four kinds of body cells, greatly magnified

different kind of work. Study the picture of the principal organs on page 63 before reading the next paragraph.

A number of organs which work together are called a *system.* You know that the digestive system changes the food which you eat in such a way that the cells can use it. What are the organs of the digestive system? The respiratory* system supplies the cells with oxygen. It gets rid of certain waste products which are given off as carbon dioxide when food is burned in the cells. The circulatory* system supplies the cells with blood, from which they take

the food and oxygen they need and into which they pour their waste products.

The cells of the body are not like bricks in a wall. They are living. Like plant cells they are chiefly



Some organs of the body

masses of a watery, jellylike substance called *protoplasm*. The picture on page 62 shows some kinds

of body cells. You see that every cell has a central part. This part is called a nucleus. Without a nucleus, the cell could not live, grow, or change. One scientist divided an animal that had only one cell into two parts. One part contained the nucleus; the other did not. The part having the nucleus quickly built up the missing part and continued to live in the usual way. But the part without a nucleus soon could not move. It could not digest food. It lived only a few days. The nucleus is essential to the life of the cells of our bodies. The cell having a nucleus moves, takes in food, and gives out waste material.

Some cells are so small that about 2,500, if they could be laid side by side, would measure only an inch. The cells in the drawings on pages 57 and 62 are very greatly magnified. In the body of a single person, there are about twenty-six thousand billion cells, one scientist says. In the blood alone there are millions and millions. All these cells are alive and must be fed. No wonder food is important!

How do the cells do their work? Naturally, one of these tiny cells cannot write a letter or throw a baseball. But millions of them together form the fifty-eight different muscles and the thirty-two separate bones in your arm and hand. And these muscles and bones can be moved in such a way that

you can write a letter and throw a ball. But not only the cells in the arm and hand are necessary in throwing a ball. The cells of the eyes, the shoulders, the back, the legs, and other parts of the body are also used. In fact, cells in all parts of the body have a share in almost everything you do. All parts of the body work together even though different parts do special work. This is an important fact.

When you have taken a very long walk, you feel tired all over. It is not only your legs that are tired. Using your eyes a great deal may cause a headache or a sick stomach — not just a pain in the eyes. You cannot neglect or harm or strain one part of the body without affecting other parts. Cells can do their work only under certain conditions. It is our part to provide these conditions. Then the cells will do the rest.

Cells must have oxygen. The air which we breathe contains plenty of oxygen. Plenty of oxygen is carried by the blood to the cells. They use as much as they need. When you are asleep, they are not very active. The smallest amount of oxygen is used during periods of rest. Cells use a great deal more oxygen when you are running or playing games than when you are sitting or lying down. In what way is deep breathing when you run hard an advantage?

Cells must have water. They are 70 to 95 per cent water. If water were taken entirely away, the cells would die more quickly than a fish out of water. Cells must have food. They must be supplied continually with the elements of which they are made. The blood carries these elements to the cells. The cells select the food elements which they need to replace those which have been worn out, or, as we say, "used up" in cell activity.

Cells must get rid of waste material. They must get rid of the carbon dioxide and acid which are formed when food is burned. They must get rid of other waste products. The blood which brings food to the cells carries away their waste products. Cells must not be harmed by poisons formed by bacteria, by alcohol, or by other harmful substances.

Of what substances are cells built? There are at least fourteen essential elements in cells. Some cells contain some of those elements; other cells contain others. If you have studied science, or read science magazines, or played a science game, you already know the names of many of these fourteen elements. How many of them have you heard of before? How many of them have you seen? With how many of them have you experimented?

Fourteen essential elements of which cells are built are carbon, hydrogen, oxygen, nitrogen, sulphur,

phosphorus, chlorine, potassium, sodium, calcium, magnesium, iron, iodine, and copper. Try to get a sample of each of the elements that are not gases.

If you forget to take the toast out of the oven and leave it there until it is burned black, you see before you the first element — carbon. Hydrogen is a colorless gas. You are breathing it now, because it is a part of air. Oxygen is a colorless gas. You are breathing it now. You could not live more than a few minutes without oxygen. Water is made of these two gases — two parts of hydrogen and one part of oxygen. Perhaps you have heard your older brother or sister who has studied science call water H_2O. Nitrogen is another colorless part of the air you breathe. Some of the nitrogen in the air is changed by bacteria into a form that can be used by plants. Some plants, like clover, alfalfa, and peas, take nitrogen from the air and store it as their food.

The others of the fourteen elements are found in the earth, usually in combination with other elements. They are food for plants. The plants in turn furnish food for animals and men. From plant and animal foods you get the elements of which the cells of the body are made.

What element is found in proteins and not in carbohydrates and fats? If you do not remember, turn

back to page 53. Nitrogen is an essential part of every cell and an especially important part of the nucleus. Proteins yield building stones for the body. In addition to a certain number of calories of food energy which are supplied by carbohydrates, proteins, and fats, the building stones in different kinds of proteins are needed.

Both meat and milk contain protein. There is proof that milk and whole wheat supply all the building material needed. Experiments with rat families show that for more than thirty generations these animals grow and keep well on a diet of one sixth dried whole milk and five sixths ground whole wheat with table salt and pure water. They had no other foods. But when the percentage of milk is increased, the animals live longer, do not show signs of old age so soon, and are healthier than the families on the smaller amount of milk. It seems quite clear that food has much the same effect on human beings that it has on the animals in the laboratory. The proteins of the cereal grains are most useful in building body cells when they are eaten with a generous amount of milk proteins.

Study the following tables. Which supplies more minerals and *vitamins** — milk or meat? (You will be told about the character and work of the vitamins later on pages 79 to 110.)

Whole Milk Furnishes		*Meat Furnishes*
Protein	Vitamin *G*	Protein
Carbohydrates	Calcium	Fat
Fat	Phosphorus	Iron
Iron	Iodine	Vitamin *G*
Vitamin *A*	Vitamin *E*	
Vitamin *B*	Vitamin *D*	

If you had very little money to spend for food, you could get more protein for twenty cents from milk, cottage cheese, oatmeal, and dried beans than from any other foods.

How much protein do you need every day? Boys and girls ten to thirteen years old should have about sixty to ninety grams of protein daily. One quart of milk, five slices of bread, a serving of cereal, one egg, and a small piece of meat or fish together with the usual amount of fruit and vegetables would furnish enough protein. Some meals contain too little protein. A meal of potatoes, bread and butter, and pancakes is low in protein. Some people eat too much protein. A meal of meat, cheese, egg salad, and bread is too high in protein.

Some boys and girls eat too much meat. They have meat three times a day. For example they have sausage for breakfast, cold pork and bread for their school lunch, and hot roast meat for the evening meal. They should keep the roast meat for dinner

and let milk, eggs, cheese, fish, fruits, and vegetables usually take the place of meat in the other meals.

Reading about cells in other books

Things to Do

1. Go to the library. Find several books on biology* or physiology.* Look up the word *cell* in the index. Study the pictures of cells in these books. 2. If you have a microscope in your school, ask your teacher to show you different kinds of cells under the microscope. 3. If you have older brothers or sisters who are studying science, tell

them what you know about cells and ask them to tell you what they know about cells. Tell them the elements of which cells are built. Ask them to tell you more about each element.

4. What can you do to furnish conditions favorable for the body cells? Discuss this question in class. 5. Make a list of the things cells need in order to live and grow. How does this list compare with the list of health habits you have written?

6. Are you holding your book up at least twelve inches from your eyes? Are you sitting with your back to the light? Are you sitting comfortably "tall" with your feet resting on the floor? Be sure you are doing all these things when you begin to read again. 7. What health habits are suggested by the facts in this chapter? 8. What conclusions can you draw from the facts in this chapter?

THE MINERALS, ONE BY ONE

You are now familiar with the food substances which supply calories of food energy and building blocks for the body. These foods are built of five elements — carbon, hydrogen, oxygen, nitrogen, and sulphur. There are still other elements which are very important for health and growth. These are the minerals. They are sometimes called the *ash constituents** because, when any food is burned completely, the minerals remain as ashes. If you heated

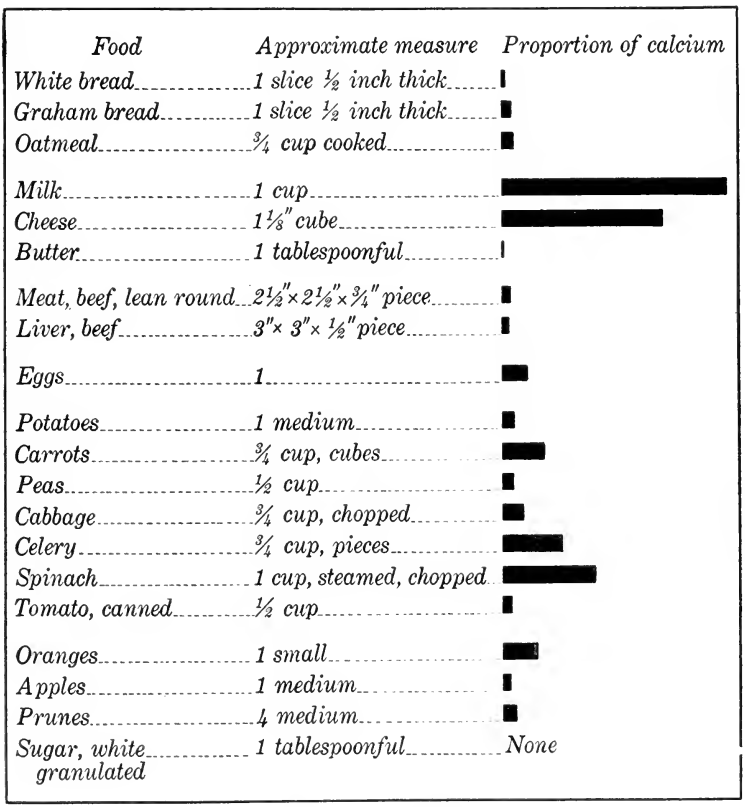
a glass of milk until all the water had evaporated, you would find about 1.3 grams of white ashes left; these are the minerals. Four of them — calcium, phosphorus, iron, and iodine — will be studied in this chapter. It is these mineral elements which are most often lacking in our daily food.

Calcium. Strong bones and teeth cannot be built without calcium. Milk is the best and cheapest source of calcium. One-half cup of milk supplies about as much calcium as two pounds of lean beef and ten slices of bread.

Green leafy vegetables are also good sources of calcium. Find other foods which contain calcium in the chart on page 73. It is interesting that the best race horses in the world grew up in parts of the country where the soil was especially rich in calcium and phosphorus.

One well-known scientist after some difficult and careful experiments with children stated that children under sixteen years of age should have one gram of calcium a day. One quart of milk supplies 1.13 grams of calcium. If you use a quart of milk a day, you need not think further about calcium. If you use three glasses a day, you need not worry, because the other foods you eat will supply enough additional calcium to make one gram. Other factors, however, such as sunlight and vitamins, determine

how well the calcium that is eaten is used by the body. Calcium is very common in limestone, chalk, hard water, and other natural substances. Plants drink it from the soil and store it up in their leaves



Calcium in food

Which foods yield the largest share of a person's daily requirement of calcium?

and stems. Cows eat the plants and thus the calcium gets into the milk.

Phosphorus. Like nitrogen, phosphorus is an essential part of every living cell of the body. Like calcium, it is essential for strong bones and teeth. You will be sure to get all the phosphorus you need if you have three cups of milk a day, and green vegetables such as spinach, lettuce, celery, cauliflower, and asparagus. Eggs also contain phosphorus.

Cereals and bread made of whole grains and dried peas, beans, and lentils are also good sources of phosphorus. If you wished to get the largest amount of phosphorus for your money, you would buy cottage cheese, oatmeal, and dried beans. Phosphorus is also very common in soils and gets into milk just as calcium does.

Iron. "Have you had your iron today?" Why is iron important? You have heard that "iron makes red blood." Yes, iron is an essential part of the red blood cells. It helps them to carry oxygen. But it is also an essential part of every living cell in the body. In the first few months of his life the baby is given orange juice, prune juice, spinach juice, and egg yolk. These foods help to supply the iron.

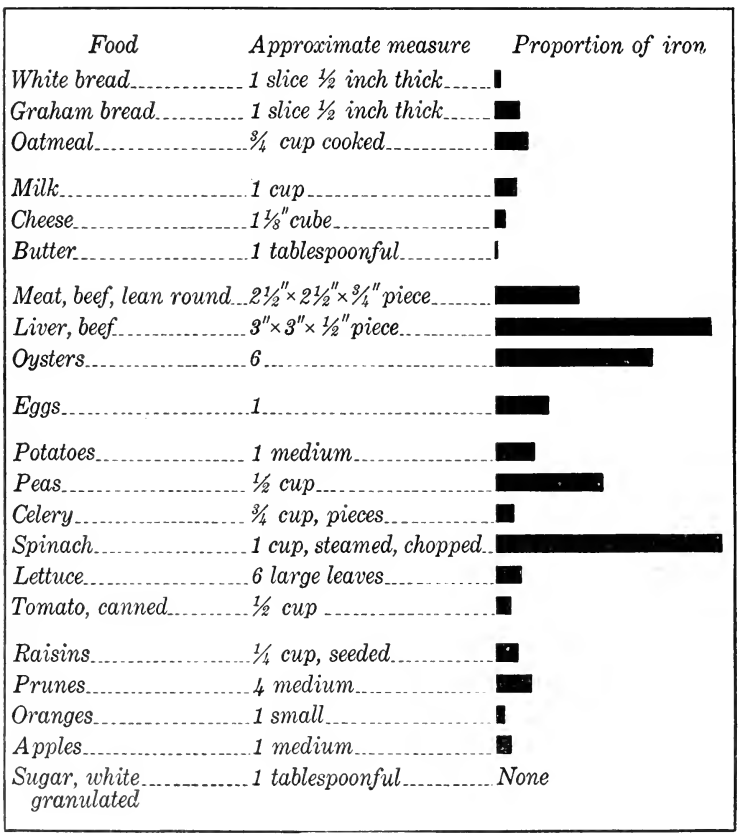
You need about .013 grams of iron daily. That seems like a very small amount. If the iron require-

ment were written in another way, it would be $\frac{13}{1000}$ of one gram. Can you imagine how small an amount this is? It is just a speck, like a grain of sand. It would seem that one need not bother about such a small amount. But this speck of iron may make the difference between health and sickness; and a person does not always get as much as he needs because iron is present in foods in very small amounts, as the following list shows:

Food	*Approximate Thousandths of Grams of Iron*
Milk, 1 quart	.0023
Whole-wheat bread, 6 slices	.0020
Egg, 1	.0014
Orange, 1 large	.0004
Potatoes, 2 medium	.0030
Spinach, 1 large serving	.0040
Prunes, 4	.0010

Add the thousandths of grams of iron in the foods in the list. If you ate these foods every day, would you be getting the amount of iron you need — .013 grams? Whole-wheat bread yields about twice as much iron as white bread. This is one reason for eating whole-wheat bread part of the time if you cannot afford many green vegetables and fruit. You can see in the chart on page 76 which foods are richest in iron. You can buy iron most cheaply in dried beans, oat-

meal, buttermilk, and spinach. An average helping of oysters would furnish about sixty calories — that is, about 2 per cent of the total number of calories (3,000) which an average man needs daily. The



Iron in food

Which foods yield the largest share of a person's daily requirement of iron?

same serving of oysters would yield about 41 per cent of the amount of iron needed daily. Oysters are almost as valuable a source of iron as liver. They contain some copper too, which seems to work with iron in making red blood. Without a very small amount of copper the body cannot make use of iron.

Iodine. Have you ever heard of iodine* before? Perhaps you have had a cut on which someone put a reddish brown liquid that made the cut sting. That liquid was tincture* of iodine. In that form and strength, iodine is a dangerous though useful poison. In another form, it is an important food element. The iodine in food is quite different from the poisonous iodine in bottles that is so useful in killing bacteria in wounds.

Iodine is found in very small quantities in the soil. It is dissolved by water and carried to the ocean. As the water in the ocean evaporates, it leaves the iodine behind. So the sea is much richer in iodine than most of the soil. People who live by the sea seldom have goiter,* a disease of the thyroid gland caused by a lack of iodine. In parts of our country goiter is common. Girls about twelve to fifteen years old, in parts of the country where the soil is lacking in iodine, often have a swelling at the front and sides of the neck which is a sign of goiter. Goiter should be treated by a doctor — not by home remedies — be-

cause it is not a simple disease. Sea foods are the richest source of iodine. Oysters, clams, and salmon roe (the fish eggs) are very rich in iodine. Certain fish, especially salmon, cod, and halibut, are also good sources of iodine. Vegetables in some states contain relatively great quantities of iodine. Some of the potatoes in our Southern states contain enough iodine in a single medium-sized potato to furnish the amount of iodine a man requires in a day.

People who live inland far from the sea or on mountains high up from the sea often suffer from lack of iodine. If you live far from the sea, ask your doctor how to get the iodine which you need. It is usually better to get your iodine in food than to take it as a medicine.

Things to Do

1. Read this chapter again. Look for the word *milk*. Write the new facts you find about milk. Do the same thing for green vegetables. 2. If you can visit a science laboratory, carry out this experiment with milk. Get an evaporating dish and weigh it. Write all the weights as soon as you find them. Fill the evaporating dish one half full of milk. Weigh it again. Boil the milk until all the water has evaporated. Weigh the dry part which is left (the residue).* The dry part is all the milk except the water. How much did the milk weigh? How much did the residue weigh? How much water evaporated? What

percentage of the milk was water? Put the residue over the fire again. Burn it up. The fat, the sugar, and the protein will go off in smoke. Only the minerals will be left. Weigh the ashes which are left. What percentage of the milk was minerals? What are the names of the minerals in milk? If you are not sure of the names, find them on page 69.

3. Go to the library and see how much you can find about one of the food elements. Ask the librarian to show you the best way to look up information on a subject like calcium, phosphorus, etc. Report to the class.

4. The next time you go to the grocery store for your mother, look over the list of foods and see whether you can improve it. Ask your mother whether you may buy one loaf of graham bread instead of all white bread. If your mother has not put any green vegetable on her list, ask her whether you may buy a head of lettuce or some spinach or cabbage.

5. Write as many words as you can think of which mean about the same as each of the following: *furnish, adequate, energy, essential.* **6.** Reread this chapter, writing each good habit that is suggested to you by the facts you read. **7.** What conclusions can you draw from the facts in this chapter?

THE VITAMINS, ONE BY ONE

About twenty years ago scientists thought that carbohydrates, proteins, fats, and minerals were the only food substances necessary for health and growth.

Little by little they got hints of unknown substances in food which promoted health and growth.

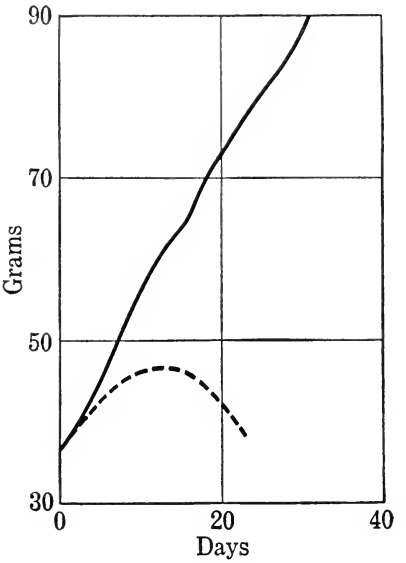
Scientists in our own country studied three groups of cattle. Each group had the same amount of proteins, carbohydrates, fats, and minerals in their diets. But these food elements were obtained from three different plants — the wheat plant, the oat plant, and the corn plant. After eating these different plants for about a year the young calves, which were alike in size and vigor at the beginning of the experiment, began to look quite different.

The corn-fed cows were sleek and healthy. They bore calves of normal size (seventy-three to seventy-five pounds each, at birth). These calves were of such unusual vigor that they were able to stand within an hour after they were born. All lived and grew. The wheat-fed cows were thin. They had rough coats. They were smaller than the corn-fed cows. The calves of the wheat-fed cows were small, weighing only about forty pounds. None of them lived. The group fed on the oat plant were midway between the other two groups.

What made the differences in these three groups? All, you remember, had the same amount of proteins, carbohydrates, fat, and minerals in their diet. The scientists were puzzled. "There must be an unknown substance in the thick green leaves of the corn plant

that is lacking in the other plants," they thought. That unknown substance was later found to be one of the vitamins. It was named *vitamin A*.

A great English scientist proved still more clearly that there were substances other than proteins, carbohydrates, fats, and minerals that were necessary for growth and health. He fed six white rats all of the then known essential food elements. The broken, curved line in the graph on the right shows that the rats grew in weight at first. But after about fifteen days they began to lose weight. Six other rats similar to the first group at the beginning of the experiment were given a small amount of milk in addition to the diet given to the first group. The solid black line in the graph shows how fast the second group of

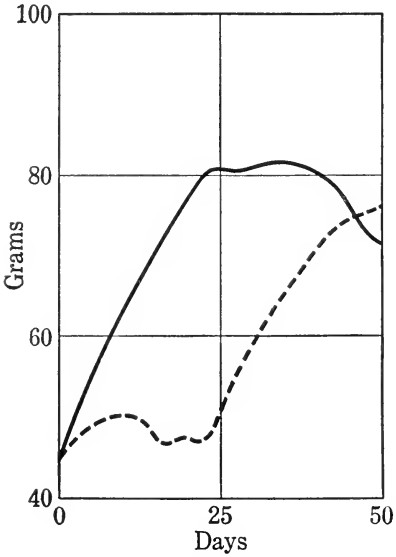


Growth of rats with and without the vitamins furnished by milk

The broken line shows the weight of rats having no milk in their diet. The solid line shows the weight of similar rats having the same diet with a small amount of milk added. What difference did milk make?

rats grew. They increased in weight steadily as long as the experiment lasted.

But was this remarkable difference in growth really due to the fact that one group had milk and the other group did not? To answer this question the scientist added milk to the diet of the first group and took it away from the other group. These growth lines show what happened. The group that had grown so fast when they had had milk stopped growing soon after the milk was taken away. After a week or two they began to lose weight. The group that had lost weight on the milkless diet began to gain rapidly soon after milk was added to their diet. The scientist saw that there must be an unknown substance in milk which was making this difference in growth.



The broken line up to the eighteenth day shows the growth of white rats on a diet without milk. The solid line shows growth of similar rats on the same diet with milk added. On the eighteenth day milk was added to the diet of the lower group and was taken away from the upper group. What changes in weight took place?

Many other tests followed these early experiments. All showed more and more clearly that unknown substances in fruit, vegetables, milk, cod-liver oil, and certain other foods were necessary for health and growth. These substances were called vitamins. The first part of the word, *vita,* means *life.* These once mysterious substances found in food were called vitamins because they were proved to be necessary to life. There are now six known vitamins. Others will probably be discovered. They are called by letters of the alphabet — vitamin *A,* vitamin *B,* vitamin *C,* vitamin *D,* vitamin *E,* and vitamin *G.* Some scientists have been studying another possible vitamin which they call *F.*

Vitamin *A*

Vitamin *A*. Has anyone ever seen vitamin *A*? Not yet. But scientists have discovered an orange-red substance which in very, very small amounts has the same effect as vitamin *A*. It is from this substance that the body manufactures vitamin *A*.

Effects of vitamin A on animals and people. Vitamin *A* is necessary for growth. Two rats which in the beginning of an experiment were of like age and size and equally healthy were given the same food, with the exception that one rat received 5 per cent of cottonseed oil and the other 1.5 per cent of butter fat

instead of cottonseed oil. The diets were alike in all other ways. The rat which had butter fat grew faster and was far healthier. Butter fat supplies vitamin *A*. Cottonseed oil is lacking in vitamin *A*. Without vitamin *A* young animals cannot grow.

Other experiments showed that animals did not grow when lard or olive oil was added to their diet of pure proteins, carbohydrates, fats, and minerals. They did grow when butter or yolk of egg was added. Scientists could make young animals grow or stop growing, just as they pleased. If they added butter or egg yolk, the animals began to grow. If they took butter and egg yolk away, the animals stopped growing. It was vitamin *A* that made the difference.

It was also found that animals which lacked vitamin *A* caught a serious eye disease. They were cured by adding a small amount of cod-liver oil to their diet. The same kind of eye disease occurred among the children of Japan at the time of a food shortage. These children were cured by feeding them chicken livers, which are rich in vitamin *A*. The same disease occurred among children in Denmark. They were cured by whole milk or cod-liver oil. The disease nearly disappeared in Denmark after butter was included, by government orders, in the daily diet of the poorer people.

The lack of vitamin *A* may lead to diarrhea and loss of appetite also.

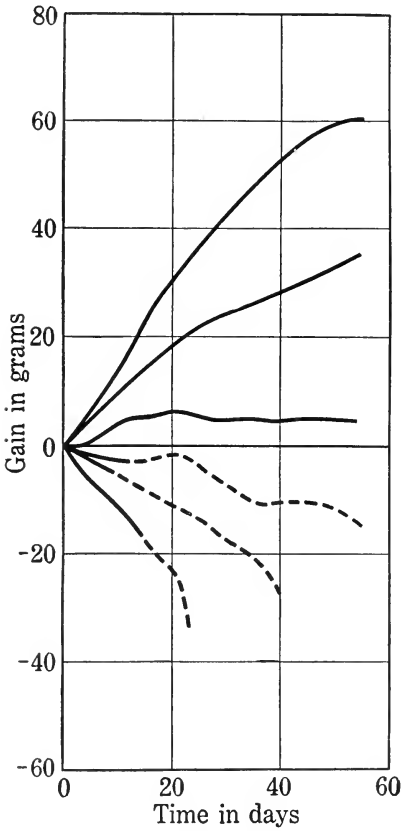
A number of scientists have proof that vitamin *A* is related to colds and other respiratory diseases. Plenty of vitamin *A* in your diet may help you to avoid colds and possibly other infections.

A well-known student of nutrition is convinced that American people, as a whole, do not get enough vitamin *A*, and that a deficiency* of it makes people less vigorous and decreases their ability to resist disease.

Even more interesting is the effect of vitamin *A* on the entire life history. Generation after generation of animals has been studied. When plenty of vitamin *A* was included in the diet, rats grew to full adult size; bore healthy, lively babies; and lived, on the average, about twice as long as those on a diet equally good in all other respects but having less vitamin *A*.

Very often boys and girls and adults say: "Look at me. I'm healthy, and I do not eat the right kind and amount of food. Does food really make a difference?" Food does make a difference, but this difference is not always seen immediately. Study the effects of different amounts of vitamin *A* as shown by the growth records on page 86. For a while the young rats on diets having a small amount of vitamin *A*

grew and seemed as healthy as the rats having a liberal amount of it. But there was a difference as they grew older. The rats on the poorer diet were not successful in raising young. They showed a tendency to have lung disease when they grew up.



The three broken lines show the effects on growth of rats that had little or no vitamin *A*. The three upper lines show the effects on other rats that had larger amounts of vitamin *A*. What were the effects on weight?

These and many other experiments show that vitamin *A* is an extremely important food element. It may make the difference between good health and sickness, natural growth and lack of growth, vigor and weakness, healthy babies and sickly babies, a long life and a short life. Vitamin *A* is necessary for adults as well as for children.

Which foods contain vitamin A? Any sub-

Some best sources of vitamin *A*

These portions of food (liver, yolk of egg, spinach, carrot, butter, American cheese, tomato, string beans, banana, lettuce, and milk) contain about the same amount of vitamin *A*.

stance which makes all these differences should be worth its weight in gold. But food sources of vitamin *A* are not costly. Everyone in our country should be able to have plenty of vitamin *A*, because it is found in our everyday foods. It is found in large amounts in butter and cream. Green leaves such as spinach and lettuce, yellow vegetables, fruits, and egg yolks are good sources of vitamin *A*. In your family can you find a way to get everyday foods rich in vitamin *A*?

The food list[1] on page 89 shows you where to get vitamin *A*. Each of these foods contains about the same amount of vitamin *A* — that is, you would be getting about the same amount of vitamin *A* if you ate a small head of lettuce, or one fourth of a medium-sized tomato, or a square of butter one-fourth inch thick, or any of the other foods in the list. Which foods contain the largest amounts of vitamin *A* for a given weight? Which foods are important sources of vitamin *A* because we use much of them in our daily diet? The amount of vitamin *A* in milk can be increased eight times by feeding cows oven-dried green alfalfa instead of brown sun-dried hay. The exact amount of vitamins cannot be given because it varies from time to time in the same kind of food.

[1] Mary Swartz Rose, *The Foundations of Nutrition*. Revised Edition, page 249. The Macmillan Company.

Food	*Approximate Measure*	*Weight in Grams*
Lettuce	1 small head	153
Whole milk	½ cup	113
Banana	1 medium-sized	87
String beans	16	64
Tomato	¼ medium-sized	44
Carrot	¼ medium-sized	6
Spinach	3–4 leaves	5
American cheese	1 square ⅔ inch by 1 inch by 1 inch	11
Butter	1 square 1¼ inches by 1¼ inches by ¼ inch	7
Liver	½ teaspoonful	3
Egg yolk	⅓ yolk	5

Vitamin *D*

Vitamin *D*. Vitamin *D* is a twin brother of vitamin *A*. In fact it was called vitamin *A* for a number of years. Crystals of vitamin *D* have been produced in laboratories. They are cream-colored and shiny. They look very much like the unflavored, unsweetened gelatine one buys in packages.

Effect of vitamin D on animals and people. Perhaps you have seen children or grown people who were bow-legged. These people had probably had a disease of the bones called rickets.* Vitamin *D*, under certain conditions, prevents and cures rickets.

Many mothers know this. They sometimes say to the doctor: "When are you going to begin giving my baby cod-liver oil?" Cod-liver oil is a rich source of vitamin *D*. Vitamin *D* is important in: (1) pre-

Photo by J. C. Allen & Son

Two bone builders. What are they?

venting rickets, (2) building strong teeth and bones, and (3) securing normal growth.

Milk and butter furnish vitamin *D*, but milk alone will not protect babies against rickets. Although milk is usually not a rich source of vitamin *D*, ways have been discovered of making milk rich in this food

substance. Vitamin *D* may be put into milk in any of the following ways: (1) Ultra-violet* rays may be made to shine on the milk itself; (2) the cows may be fed yeast on which ultra-violet rays have

Sunlight and health

shone; (3) a concentrated form of vitamin *D* obtained from cod-liver oil may be added to the milk. These three methods all enrich milk with vitamin *D*.

Vitamin *D* has some of the same effects as sunlight. It has been called the "sunshine vitamin."

If a mother cannot buy the amount of cod-liver oil for the baby recommended by her doctor, she can see that the baby has plenty of sunlight. Sunlight is good for older children too. You can sit in a sunny, open window or play out of doors in the sun every warm, bright day.

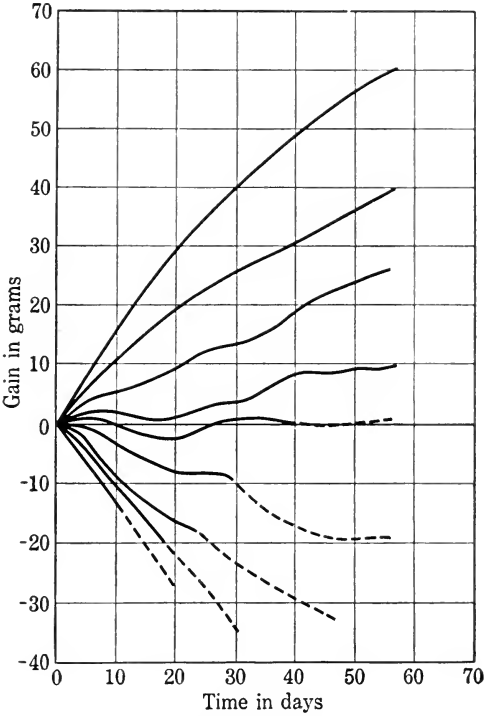
Vitamin *B*

Vitamin *B*. Before vitamin *B* had a name, it was known as the substance in the brown coats of rice grains which prevents and cures a disease called *beriberi*.* Sailors and people on a diet of white rice often used to have this disease.

Again and again it was shown that beriberi could be produced by feeding white rice and that it could be cured by feeding the brown husks which had been rubbed off to make the rice white. What was the mysterious substance in the brown coats of the rice grains that made the difference between sickness and health? Nobody knew exactly. An immense amount of work has been done to discover the chemical nature of this substance. But after twenty years of experimenting, the exact composition* of vitamin *B* is still unknown. Scientists are still studying vitamin *B* and have now secured in their laboratories white crystals which seem to be pure vitamin *B*.

Effect of vitamin B on animals and people. As you have just read, vitamin *B* prevents and cures the disease called beriberi. Without vitamin *B* animals and men become sick with this disease. They are quickly cured by vitamin *B*.

Vitamin *B* is necessary for growth. The unknown substance in milk which the English scientist found made rats grow was later discovered to be vitamin *B*. (See growth lines on this page.) Many experiments have proved that vitamin *B* added to an otherwise adequate diet made animals grow, and that growth could be stopped by



This graph shows the effect on the growth of white rats of different amounts of vitamin *B*. The lowest line shows the result of having no vitamin *B*. The downward slant means a great loss in weight. Each of the other lines shows the growth of white rats having more and more vitamin *B*. How does vitamin *B* affect weight?

withholding this substance. Even a small amount of vitamin *B* makes a difference in growth, as is clearly shown by the gains in weight of rats which were fed different amounts of it.

Another effect of lack of vitamin *B* is loss of appetite. Loss of appetite results in less food being eaten. Eating too small an amount of food checks growth. Vitamin *B* is also important for mothers and their babies.

The effects of vitamin *B* are not shown at once. For some time after vitamin *B* has been taken away, the animals are bright-eyed, lively, sleek-coated. Then a change takes place. The rats become slow-moving. Their fur becomes rough and dull. They huddle in corners away from the light. They look sickly and thin. They feel cold. It is very clear that vitamin *B* is essential for the growth and health of young rats.

Which foods contain vitamin B? Muscle meats and white bread are poor in vitamin *B*. The heart, liver, and kidney contain this vitamin in a somewhat larger proportion than muscle meat. Most of our other everyday foods, however, contain vitamin *B* in considerable amounts.

The following list[1] shows the foods which contain

[1] Mary Swartz Rose, *The Foundations of Nutrition*. Revised Edition, page 286. The Macmillan Company.

Some best sources of vitamin *B*

These portions of food (wheat germs, spinach, cabbage, carrots, eggs, milk, orange juice, lettuce, and bananas) contain about the same amount of vitamin *B*.

vitamin *B* in the largest amounts. All of these amounts of food contain approximately the same amount of vitamin *B*. Which of these foods contain the largest amounts of vitamin *B* for a given weight? Which foods are important sources of vitamin *B* because we use them daily in large amounts?

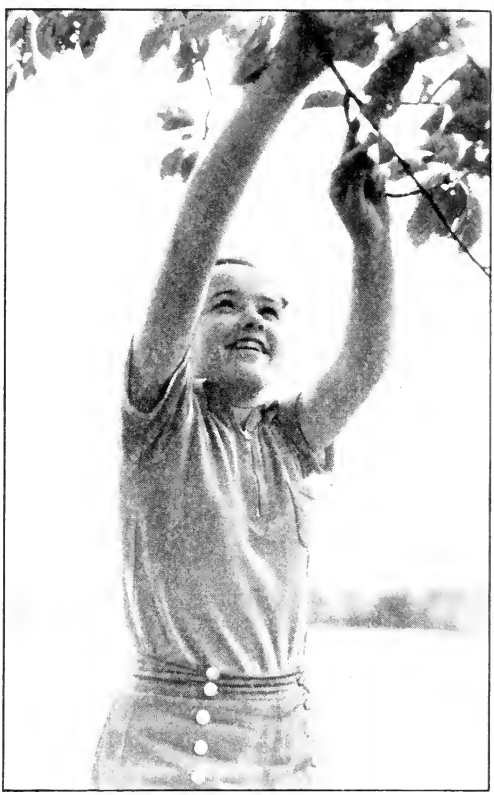
Food	*Approximate Measure*	*Weight in Grams*
Lettuce	1 very small head	130
Spinach	40–50 leaves	65
Milk	$\frac{5}{8}$–$\frac{3}{4}$ glass	151
Orange juice	$\frac{5}{8}$–$\frac{3}{4}$ glass	151
Carrots	3 or 4 small	175
Banana	1 very large, or 2 small	270
Cabbage	$\frac{1}{8}$ head	82
Wheat germ	$\frac{1}{2}$ teaspoonful	4
Eggs	2	100

Whole grains, nuts, and beans are fairly rich in vitamin *B*, or in vitamins *B* + *G*. A diet consisting largely of cereals would probably contain enough vitamin *B* if the entire grain were used.

Vitamin *C*

Vitamin *C* is one of the most interesting of the vitamins. Before the Revolutionary War, it had long been known that lemon juice, orange juice, and

other foods which contain this vitamin in largest amounts would prevent scurvy* — a disease very common among sailors years ago. Now vitamin *C* itself has been secured in the laboratory in the form of white crystals.



Vitamin *C* from a cherry tree

Effects of vitamin C on animals and men. Two Norwegian scientists studied scurvy in animals and in men. They wanted to learn the cause of scurvy. They fed guinea pigs a diet of cereals and bread. The guinea pigs promptly lost weight and showed the same signs of scurvy as did the sailors. They were cured by raw cabbage, dandelions, lettuce, potatoes, carrots, bana-

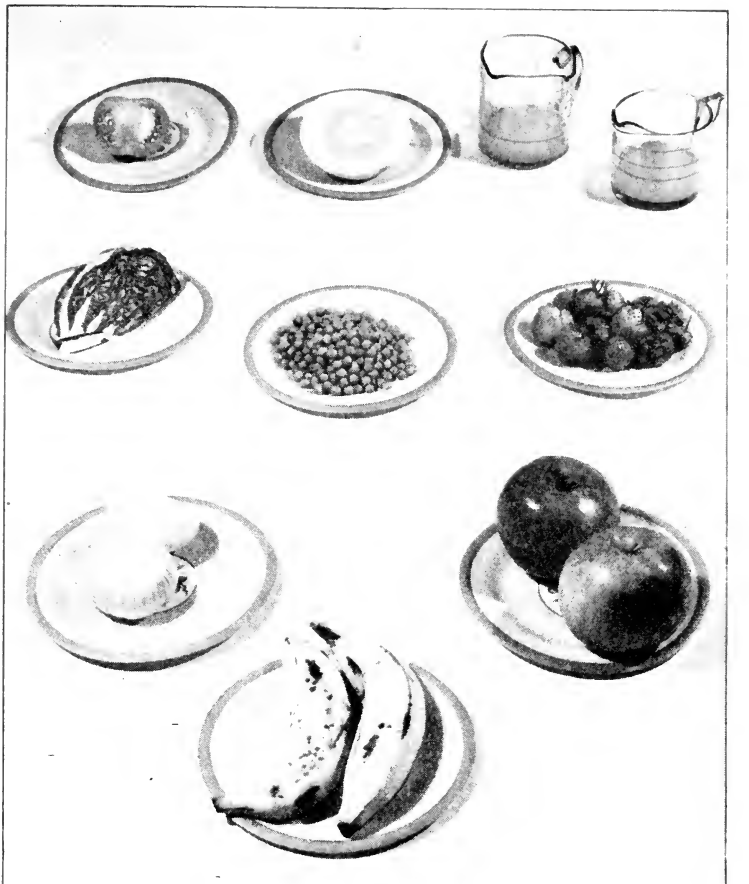
nas, and apples. The use of vitamin *C* in preventing and curing scurvy is well known.

But the teeth are harmed by lack of vitamin *C* long before signs of scurvy appear. Two English scientists found that lack of vitamin *C* caused startling changes in the teeth of guinea pigs. The soft, inner pulp of the teeth dried up. The bony part of the teeth became soft. Cavities* appeared. The gums became red and sore. When the guinea pigs were fed lettuce, orange juice, and other foods containing vitamin *C*, the teeth and gums became healthy again. In a number of experiments the condition of the mouth was greatly improved by adding orange juice to the diet. Good teeth may depend to a large extent upon vitamin *C*. You may have read in advertisements about that disease of the gums called *pyorrhea*.* Vitamin *C* may help to prevent pyorrhea and bleeding gums.

Which foods furnish vitamin C? One of the best sources of vitamin *C* is lemon or orange juice. Lemon juice has been made into tablets and taken on polar expeditions.

The list on page 100 [1] shows some of the foods richest in vitamin *C*. All of the foods in the amounts given contain about the same amount of vitamin *C*.

[1] Mary Swartz Rose, *The Foundations of Nutrition.* Revised Edition, page 317. The Macmillan Company.



Some best sources of vitamin *C*

These portions of food (tomato, grapefruit, orange juice, lemon juice, cabbage, peas, strawberries, raw onions, apples, bananas) contain about the same amount of vitamin *C*.

Food	*Approximate Measure*	*Weight in Grams*
Apples	2	424
Peas, canned	$\frac{3}{8}$ cup	90
Cabbage, raw	$\frac{1}{8}$ head	90
Lemon juice	$\frac{1}{4}$ cup	60
Orange juice	$\frac{1}{4}$ cup	60
Onions, raw	2 medium-sized	150
Bananas	2 large	280
Strawberries	14	90
Grapefruit	$\frac{1}{2}$ small	60
Tomato	$\frac{1}{2}$ small	60

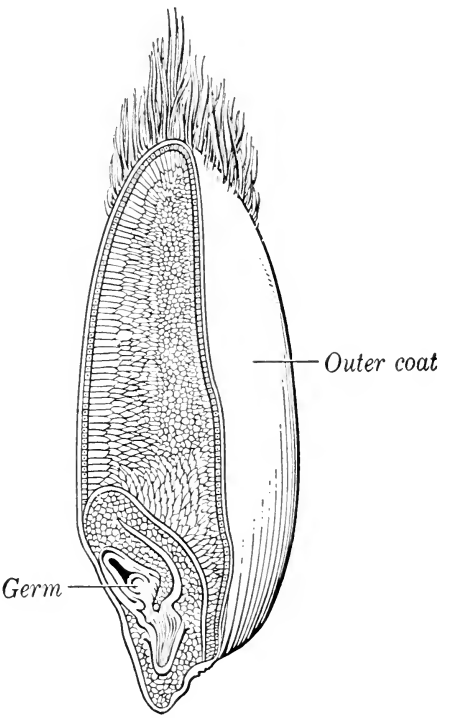
The vitamin *C* in tomato juice is not destroyed by heat. Canned tomatoes are almost as good a source of vitamin *C* as fresh tomatoes. But part of the vitamin *C* in cabbage, onions, and other foods is lost when they are cooked. There is only about 90 per cent as much vitamin *C* in cabbage cooked in the ordinary way as in raw cabbage.

Canned fruits and vegetables have the same amount of proteins, carbohydrates, and minerals as the fresh foods. But some of the vitamins are destroyed by cooking. The question "Do canned foods contain any vitamins?" has recently been answered. Cooking destroys vitamin *C* to a large extent in the case of many foods. Vitamin *A* is partly destroyed by cooking. But, in one series of experiments,

canned foods were found to be richer in these vitamins than the same foods cooked in the ordinary way. To be on the safe side, every family should include some raw vegetable and fruit in its daily diet.

VITAMIN *G*

For some time scientists believed there were only three vitamins — vitamin *A*, vitamin *B*, and vitamin *C*. More recently three other vitamins have been discovered. They have been named vitamin *D*, vitamin *E*, and vitamin *G*. Vitamin *D* has already been described. Vitamin *E* seems to play little part in human nutrition. Vitamin *G* has been studied a great deal, but scientists have not yet produced pure vitamin *G* in the laboratory.



A rich source of vitamin *G*: the germ of the wheat grain greatly enlarged

Vitamin *G* like the other five vitamins is necessary for health and growth. Rats fail to grow as they should on a diet which supplies all the known vitamins except *G*. They begin to gain in weight quickly when they are given a small amount of yeast. Vitamin *G* is found in yeast in large amounts. It is also contained in milk. Animals having the largest amount of vitamin *G* in the form of milk grow best. Smaller amounts of this vitamin show plainly in the growth records. The less vitamin *G* the rats had, the less they grew. Yeast and wheat germ are the two richest sources of this vitamin. Find the germ of a grain of wheat in the greatly enlarged picture of a wheat grain shown on page 101. The following list, taken from the same source as previous lists,[1] shows foods which contain vitamin *G* in largest amounts:

Food	*Approximate Measure*	*Weight in Grams*
Lettuce	½ small head	79
Spinach	30–40 leaves	50
Beet tops	10–15 leaves	20
Carrots	1 or 2 small	79
Potatoes	2 medium-sized	200
Banana	1 large	223
Beef liver	1 teaspoonful	6

[1] Mary Swartz Rose, *The Foundations of Nutrition.* Revised edition, page 374. The Macmillan Company.

Egg white	2	50
Egg yolk	1½	22
Beef, lean	slice, 3 inches by 1 inch by 1 inch	50
Orange	1 small	134

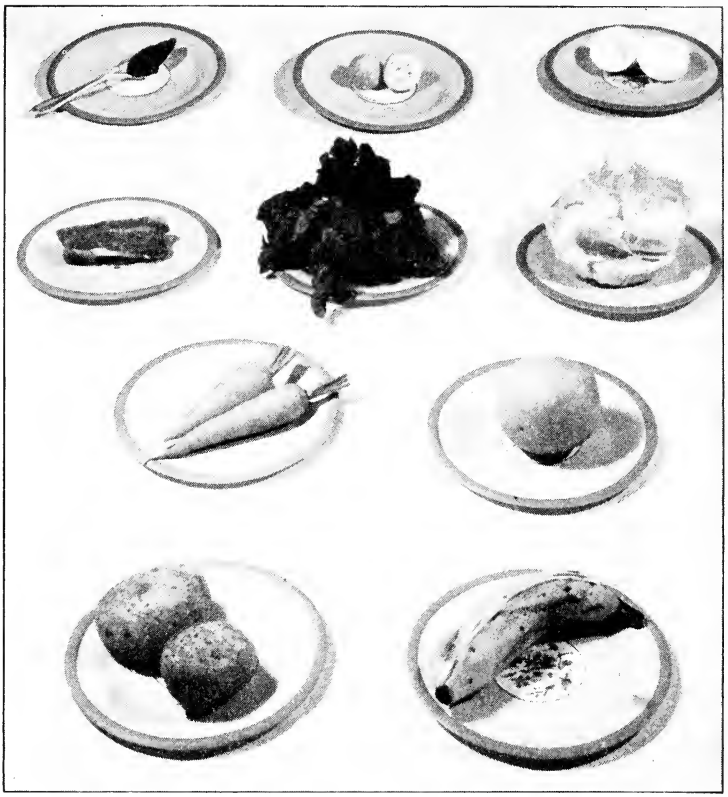
Heating does not easily destroy vitamin *G*. Canned foods are almost as rich in this vitamin as are the uncooked foods. In the case of what other vitamins have you learned that cooked or canned food is nearly, if not quite, as rich in vitamins as uncooked food?

Summary of the Vitamins

Before you read this paragraph, close your eyes and try to remember why each vitamin is important, and what foods supply it in the greatest abundance. Then read the following summary to see if you were right:

Vitamin A: Necessary for growth; for the prevention of a certain kind of eye disease and possibly other infections such as colds; also for healthy babies. Best sources: butter, cream, whole milk, egg yolks, thin green leaves, and fruits.

Vitamin B: Necessary for growth; for the prevention of beriberi; for a good appetite; and for healthy babies. Best sources: Yeast, wheat germ, whole cereals, milk, carrots, cabbage, spinach, lettuce, and dried peas and beans.



Some best sources of vitamin *G*

These portions of food (beef liver, egg yolks, egg whites, lean beef, spinach, lettuce, carrots, orange, potatoes, and banana) contain about the same amount of vitamin *G*.

Vitamin C: Necessary for growth; for the prevention of scurvy; for healthy teeth and gums. Best sources: raw fruits and vegetables, especially oranges, lemons, and tomatoes.

Vitamin D: Necessary for growth; for the prevention of rickets; for good bone and tooth development. Best sources: butter, egg yolk, and cod-liver and other fish oils.

Vitamin E: Plays little part in human nutrition.

Good teeth. What helps to build them?

Vitamin G: Necessary for health and growth. Best sources: yeast, liver, milk, wheat germ, and green leaves.

In general, all the vitamins except vitamin *E* are necessary for human health and growth.

Vitamins in Our Daily Food

Is it possible to include enough of all the vitamins in our food every day? Now that you know so much about vitamins, you will find it very easy to include some good source of each vitamin in your daily diet. See how many vitamins are included in the following cheap, simple meals:

Breakfast

Whole-wheat cereal (*B*, *G*)
Whole milk (*A*, *G*, *D*)
Roll and butter (*A*)

Dinner

Baked potatoes (*C*, *B*)
Bread and butter (*A*)
Poached egg (*A*, *B*, *D*)
Raw cabbage salad (*C*, *B*)
Ice cream (*A*, *D*, *G*)

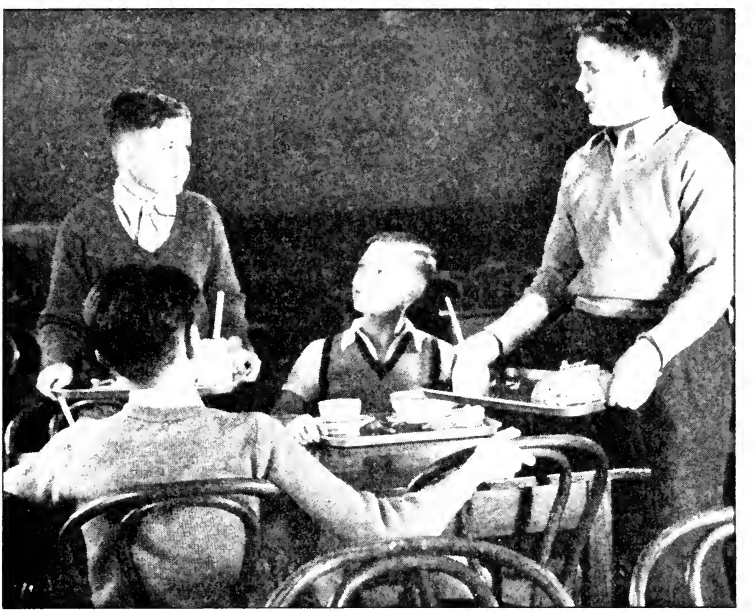
Supper

Cream of spinach soup (*A*, *G*, *D*)
Whole-wheat bread and butter (*B*, *G*, *A*)
Cookies

All the vitamins are represented in this day's food. You could make these meals still richer in vitamins by adding orange juice or other fresh fruit to the breakfast, carrots or another vegetable to the dinner, and applesauce or fruit salad to the supper menu.

Bread and meat alone can never make an adequate diet for anyone — least of all for a growing

child. Bread and meat are lacking in some of the essential vitamins. But if you have, in addition to meat, milk, butter, and eggs, some raw green vegetable, canned tomatoes, or fresh fruit and some cereal



A chance to choose vitamins

or bread made from whole grains, you will be getting enough of each kind of vitamin. It is easy to plan meals from ordinary wholesome foods which contain enough of all the vitamins. There will then be no need to buy the vitamin preparations which are for sale.

Every time you drink milk, you are getting some of all the vitamins with the possible exception of vitamin *C*. Milk in any form may be used — pasteurized* milk, evaporated milk, or dried milk. Milk does not lose much of its vitamin *A* or *B* when it is properly pasteurized, canned, or dried. It is possible to have an adequate diet without milk, but it is much easier to be sure of having all the essential food elements by buying a quart of milk a day for every child in the family and at least a pint a day for every adult.

Every time you eat butter on your bread or potatoes, you are getting a good deal of vitamin *A* and vitamin *D*. Every time you eat egg yolk, you are getting vitamin *A*, vitamin *D*, and vitamin *G*. Every time you eat oranges, tomatoes, and raw cabbage you are getting large amounts of vitamin *C* and vitamin *B*. It is wise to spend for vegetables and fruit about one fifth of all the money the family spends on food. Every time you eat bread or cereals made from whole grains, you are getting vitamin *G* and vitamin *B* in generous amounts. Every time you eat lettuce, you are choosing a good source of vitamin *A*, vitamin *C*, and vitamin *B*. Every time you take cod-liver oil, you are choosing the best source of vitamin *D*.

Have you had your vitamins today?

Things to Do

1. If you live in the country, try to raise enough green vegetables so that your family will have a green vegetable every day. If your father does not keep chickens, perhaps he will let you have a few, so that everyone in your family will have an egg every day or two.

Photo by J. C. Allen & Son

Judging 4-H-Club boys' chickens

2. Make posters showing the best sources of each vitamin — one showing the best sources of vitamin *A;* another, showing the foods richest in vitamin *B;* another,

showing the best sources of vitamin *C;* another showing the best sources of vitamin *D;* and so on. Cut pictures of the foods out of magazines and seed catalogs and paste them on cardboard or heavy paper. Draw pictures of each of the foods, if you wish, instead of cutting the pictures out of magazines. Which foods are the best sources of almost all the vitamins?

3. Tell your older brothers and sisters about vitamins if they do not know about them.

4. Look for the word *vitamin* in the health columns of newspapers and magazines. See how many clippings about vitamins you can collect. How many of the advertisements mention vitamins? How many false statements can you find? Can you correct the false statements so that they will be true?

5. At mealtime today tell your family about some of the experiments described in this chapter. Give the facts accurately.

6. Look in your school library for books and magazine articles about vitamins. Ask your teacher to tell you some of the best books and articles to read. Tell the class some of the most interesting facts that you find.

7. Which vitamin has been called the *sunshine vitamin?* Plan a time every day to have the sun shine on some part of your bare skin.

8. What important health habits are suggested to you by the facts about vitamins in this chapter?

9. Write the conclusions which you can draw from the facts in this chapter.

CHOOSING FOOD FOR THE DAY

Are there any other food substances besides carbohydrates, fats, proteins, minerals, and vitamins which are needed for health and growth? There is another important substance which has not yet been mentioned. Without it you would not have an adequate diet even though you had plenty of calories, proteins, minerals, and vitamins. This other essential substance is the fibrous* framework of fruits, vegetables (especially of leaves and stems), and whole grains. It is not digested. It helps the body to get rid of waste material. The best foods to supply this fibrous substance are green leafy vegetables such as cabbage, celery, lettuce, and spinach; other vegetables and fruit such as squash, tomatoes, oranges, and apples; breads and cereals made from whole grains.

You already know that doctors often advise people who are troubled with constipation* to include these foods in their daily meals. A good way to help to have a regular bowel movement daily is to eat fruits or vegetables in each meal.

Food Values of Special Foods

Food value of tea and coffee. You have already learned that tea and coffee are too stimulating. They keep people wide-awake and too active when

they need rest. They crowd out milk. You will be interested now in seeing how tea and coffee compare with milk in regard to food values. Tea and coffee furnish only water. Milk furnishes water, protein, fat, sugar, calcium, phosphorus, and vitamins *A*, *B*, *D*, and *G*. Which do you choose? Tea, coffee, or milk? Which do you give to your brother or sister?

Food value of candy. As long as you can remember, you have probably been told not to eat too much candy, to eat candy only at the end of a meal, to eat fresh fruit — not candy — if you are hungry at recess or after school, and to make dried fruit candies instead of fudge and other candies made of white sugar. Is there any really scientific reason for doing these things? You have already learned that sugar may harm the teeth by crowding out other foods and by furnishing food for bacteria.

How does sugar compare with sweet fresh fruit in the food elements it furnishes? White sugar supplies many calories. Carbohydrates, however, are the only food substances in sugar, while fresh fruits contain carbohydrates, iron, calcium, phosphorus, and vitamins *C*, *A*, and *B*. Which will you choose — candy made of white sugar or sweet fruits?

Food value of soft drinks. About twelve billion bottles of soft drinks such as ginger ale, soda water, and orange drinks were sold in the United States in

Photo by J. C. Allen & Son

A healthful holiday

a recent year — an increase of one billion bottles over the year before.

Soft drinks differ greatly in health values. The worst kinds of soft drinks are those which contain drugs, such as caffeine.* The best kinds of soft drinks are those which are made of fresh fruit juices or milk. Most drinks are nothing but water sweetened, colored, flavored, and charged with gas. See the difference in food value between real fruit juices and artificially colored and flavored drinks:

The food elements in fresh orange juice are sugar, iron, calcium, phosphorus, and vitamins *A*, *B*, and *C*. The only food element in ordinary soda water is sugar.

The food elements in a milk shake are sugar, protein, fat, calcium, phosphorus, and vitamins *A*, *D*, and *G*. The only food element in ginger ale is sugar. Which do you choose?

Great progress has been made in using natural fruit juices and milk drinks in place of artificially colored and flavored drinks. Every time you choose fresh fruit juices or grape juice instead of "soda pop," you are encouraging the storekeepers to sell more of the fresh fruit drinks.

Every time you choose a milk shake instead of ginger ale or other similar soft drinks, you are increasing the sale of the better kinds of drinks. Storekeepers sell the kinds of drinks people want to

buy. Your example is important. Other people will be more likely to choose fresh fruit juices and milk drinks if they see you buying and enjoying them.

How should soft drinks be served? Some stores use paper cups instead of glasses. A new paper cup

Drinking orange juice from sanitary paper cups

is used for each person. This is the most sanitary way of serving drinks. There is danger from bacteria in carelessly washed glasses. Some upper-grade boys described a pushcart selling "lemonade" for two cents a glass, as follows: "The lemonade is

made by adding water to a small cube of some kind. A bit of lemon peel is then floated on top. The man washes his few glasses over and over again in dirty water in a pail." In one city 30 per cent of the drinks tested contained disease-producing bacteria. Only when glasses are washed in hot, soapy water and rinsed in clean, boiling water are the bacteria killed.

Wise Choice of Food

Some people think there are special diets for special purposes, such as building blood, building muscle, and building teeth. But you can see clearly that our everyday foods — milk, cereals, vegetables, and fruits — build all kinds of body tissue.

Dr. Henry Sherman's rule for an adequate diet is: A quart of milk a day. Large servings of fruit or raw vegetables, as in salad, twice or three times a day. A green or yellow vegetable at least every other day. An egg every other day. Half of the total of bread and cereals in the "whole-grain" or "dark" form.

A single food is not adequate for good nutrition. Cereal, bread, and potatoes do not supply all the elements the body needs. Give proofs that this is true. But these foods can be combined with milk, eggs, leafy vegetables, and meat so that the elements lacking will be supplied.

Hundreds of recent discoveries have shown the

importance of a wise choice of food. With proper food better than average health may be won. Life is lengthened. Certain diseases are prevented. The best kind and the right amount of food make possible a high degree of well-being.

These first eight chapters are not just "something to read." They are "something to put into practice." Have you tested your meals by your knowledge of vitamins and the other essentials of an adequate diet? A junior high school class that studied about calories, minerals, and vitamins made real changes in food habits. The class persuaded the stores of the neighborhood to sell more bottles of milk; cocoa made with milk instead of with water; and egg, lettuce, and cheese sandwiches. The first day the storekeeper offered peanut butter, egg, and lettuce sandwiches, he sold forty-one; the next day he sold sixty sandwiches. In front of the school building were pushcarts selling cheap, insanitary* drinks and "hot dogs." The boys passed them by. They bought better lunches. For example, one boy's lunch showed this rapid change: The first day he ate a frankfurter and roll and a piece of rich pastry. What food values did he buy? The second day he had ice cream and a piece of pie. What food values did he get this time? The third day he chose an egg sandwich and a glass of milk. Now he is bringing

egg sandwiches from home, buying milk, and trying to remember to have fruit also. What food values does he now get?

Three girls learned to choose excellent meals in their school cafeteria.* Mary had fifteen cents, Alice had thirty-five cents, and Helen had fifty cents to spend for their lunches. Each made a wise choice of lunch from the following list of food:

Vegetable soup	10 cents
Cream of asparagus soup	10 cents
Carrots and peas	10 cents
Mashed potatoes	5 cents
Rice	5 cents
Hamburg steak and potatoes	25 cents
Buttered cabbage	10 cents
Pineapple-and-cream-cheese salad	15 cents
Spinach-and-egg salad	15 cents
Milk	5 cents
Roll	2 cents
Bread	2 cents
Butter	2 cents
Cocoa with whipped cream	10 cents
Vanilla ice cream	10 cents
Baked apple	10 cents
Chocolate layer cake	10 cents
Fruit cup	10 cents
Prune pie	10 cents
Cookies	3 cents

Mary spent her fifteen cents on a big bowl of cream of asparagus soup with crackers and a dish of mashed potatoes. The milk and butter in the

Would you know what foods to choose in a cafeteria?

cream of asparagus soup contained vitamins *A* and *B*, calcium, phosphorus, and protein. The asparagus added iron and more vitamins. For dessert she ate an apple and some cookies which she had brought from home. The raw apple fur-

nished vitamin *C* as well as more vitamin *B* and minerals.

Alice, who had thirty-five cents to spend, also bought the cream of asparagus soup. The spinach-and-egg salad looked so good with its light-green, crisp lettuce and dark-green, chopped spinach decorated with the gold and white circles of hard-boiled eggs, that Alice chose it. The lettuce furnished vitamin *C*, and the spinach supplied vitamins *A* and *B* in large amounts. Asparagus, spinach, and egg yolk were all rich in iron and other minerals. Alice spent her remaining ten cents on vanilla ice cream, which was another good source of vitamins *A* and *B*.

Helen usually had her supper at night and her dinner in the middle of the day. That was why her mother gave her fifty cents to spend at noontime. Helen chose vegetable soup; and a very good vegetable soup it was, thick with carrots, peas, potatoes, celery, and onions. It supplied minerals and vitamins. She had forty more cents to spend. As this was her dinner, she chose meat and potatoes. The meat furnished iron and protein; the potatoes, vitamin *B* and minerals. For dessert she chose a big baked apple with cream and molasses cookies with raisins in them. The baked apple and cream furnished vitamin *A*, vitamin *B*, iron, and calcium.

Some boys and girls who had no money to spend brought cheese or egg or lettuce sandwiches and fruit from home. All the boys and girls in that school tried every noon to choose an *A* lunch. An *A* lunch is one which contains the "Big Three" — fruit or vegetables, milk, and cereal or bread.

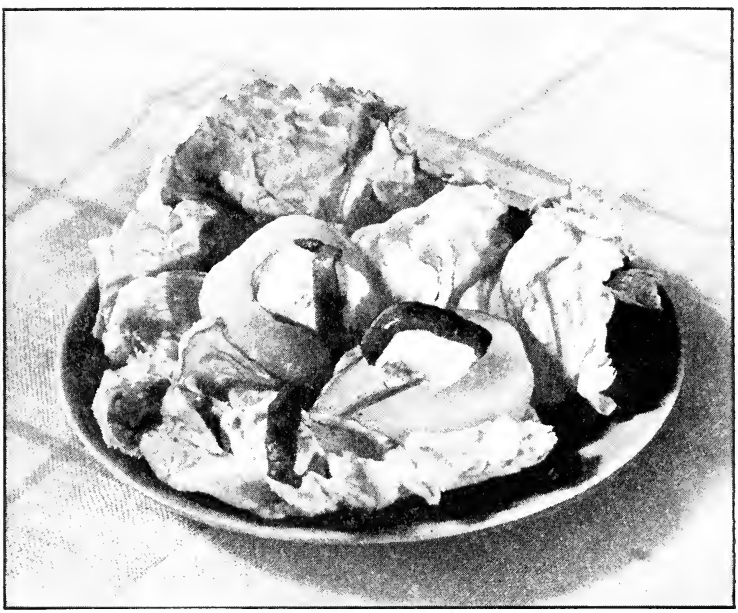
If you are interested in good meals at low cost, ask your teacher if she can get some bulletins which tell how to have healthful food even though you have little money to spend.

Things to Do

1. From the cafeteria menu on page 118 choose three good lunches. For one, you have 20 cents to spend; for another, 30 cents; and for the third, 40 cents. Perhaps in your school the food is much cheaper than it is on the luncheon menu in this book. So much the better. Write beside each food you have chosen for the lunches its special food value in calories. Check each lunch to see that you have at least one good source of vitamin *A*, vitamin *B*, vitamin *C*, calcium, phosphorus, iron, protein, carbohydrate, and fat. If you have no cafeteria in your school, plan a good lunch to bring from home, or find out the best places in the neighborhood to get milk and vegetables served in a clean, sanitary way. 2. Plan a party for your own friends or for your younger brothers and sisters. Serve the refreshments at a regular mealtime. Have a menu like one of the following:

1. Sandwiches
   Fruit
   Gelatin with whipped cream
   Fruit salad
   Ice cream and date cookies

2. Sandwiches
   Hot chocolate
   Fruit cup — apples, bananas, oranges, with whipped cream on top



A favorite fruit salad

3. Oyster soup
   Fruit salad and crackers
   Ice-cream cones

4. Creamed chicken
   Mashed potatoes
   Pear salad
   Ice cream

You may be able to plan an outdoor party and cook your lunch or supper out of doors, in the back yard,

in the woods, or on the beach. Then you can have a meal like this:

Lettuce and tomato sandwiches
Bacon or steak broiled over the fire
Apples, oranges, and bananas
Marshmallows to roast

3. Make a sweet fruit salad for dessert the first chance you have. Find some recipes in a cookbook, magazine, or newspaper.

4. Make a list of the foods richest in vitamin *A*. Do these foods also yield a large number of calories? Turn to the chapter on calories to find the number of calories in different foods.

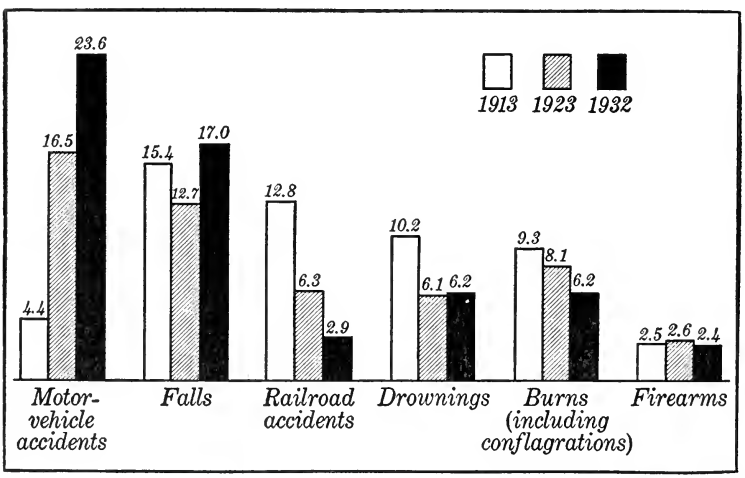
SAFETY PROBLEMS

Can you imagine how many two billion dollars are? In figures it looks like this — $2,000,000,000. Perhaps you have wished you were a millionaire. Two billion dollars would be enough to make two thousand millionaires. This huge amount of money is said to be the cost of accidents and injuries in the United States during 1932. In fact, the actual cost is probably more than this amount. Safety saves money. Safety is the opposite of waste.

How large is the town you live in? There are many towns of 10,000 people. Imagine nine towns of this size. If practically all the people in these nine

large towns were destroyed, the total number would just about equal the number of people killed by accidents in the United States in 1932.

A glance at the charts on this and the opposite page shows that there are plenty of safety problems for both children and adults to solve.



Courtesy National Safety Council

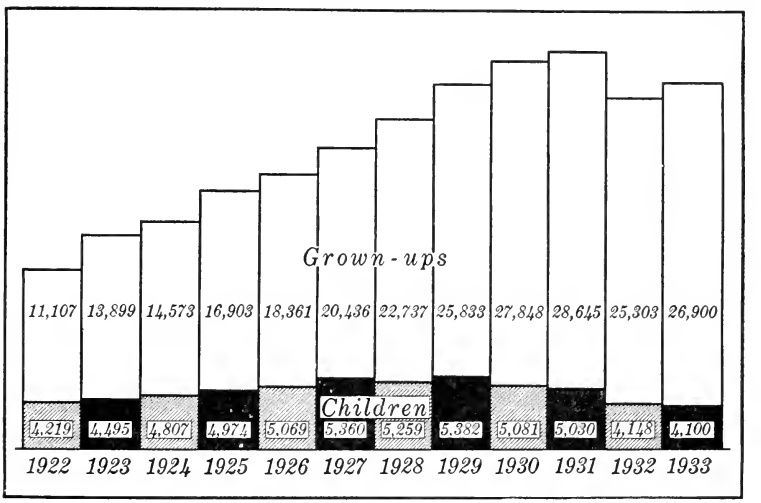
Chief causes of accidents

What are the chief causes of accidents? Which kinds of accidents have increased from 1913 to 1932? Which kinds of accidents have decreased? How can you help to decrease the number of accidents?

The chief causes of accidental death to children are automobiles, drowning, burns and scalds, and falls. How many of these might have been prevented?

But there are encouraging signs, too — signs that the number of accidents can be decreased through the

efforts of school children. During the years 1922 to 1931, in the United States there was an increase of 158 per cent in adult deaths from automobiles and other motor vehicles. But there was an increase of only 19 per cent for children of school age during the



Courtesy National Safety Council

Motor-vehicle accidents

Are accidents from automobiles and other motor vehicles increasing or decreasing among grown-ups? Among children? What can you do to decrease the number of automobile accidents?

same years. In 1931 there was a drop of 6 per cent from 1929, and a still greater decrease in 1932, in the number of children killed by motor vehicles. School boys and girls are winning in the fight for safety. They must continue to think and act carefully and quickly.

Why Accidents Happen

What causes so many accidents? One cannot remedy any evil until he knows its cause. You know the general causes of accidents. They have already been mentioned in this chapter. But knowing the general causes does not help you very much in preventing these accidents. If you knew the causes more definitely, you might avoid doing the things that lead to accidents.

Records of accidents in a number of schools give suggestions for avoiding accidents in the same grades of other schools. The accidents in these schools are listed here. What might have been the causes of each of these accidents? Tell how you think each accident might have been prevented.

ACCIDENTS WITH AUTOMOBILES AND STREET CARS

Cut or bruised when riding on running board of an automobile.

Badly hurt when a speeding automobile upset.

Arm broken when bicycle ran into an automobile.

Sprained* ankle when stepping from street car in motion.

ACCIDENTS WITH GLASS AND KNIVES

Cut with knife.

Finger cut on tin can.

Finger cut on piece of broken glass.

Cut while playing with open penknife.

ACCIDENTS WITH FIRE

Burned while building a fire in a stove.
Spilled hot coffee on leg.
Burned when standing too close to open fireplace.

ACCIDENTS WHILE PLAYING

Foot stepped on while playing ball.
Eye hurt while playing ball.
Arm bruised by fall on concrete while playing ball.
Deep scratch on leg caused by fall while playing ball.
Finger sprained, hit by baseball.
Ankle sprained while playing ball.
Arm broken while roller skating.

MISCELLANEOUS ACCIDENTS

Finger caught in swinging door while hurrying from room.
Ankle sprained by falling down steps.
Head cut in fall from a ladder which slipped.

In studying these accidents you probably have discovered the most important causes of many kinds of accidents. Let us summarize them.

1. Doing unnecessarily dangerous things. Danger lurks in certain activities. A large number of accidents, for example, are caused by riding on running boards of cars and "hooking" rides with sleds. Such accidents could be prevented by putting a good type of adventure, such as skating or playing ball, in place

of dangerous activities. Clever boys and girls invent and discover new adventures of a safe kind to replace dangerous activities which they should avoid.

Photo by Hamilton M. Wright

One good way of rescuing a person who has broken through the ice

2. Speed. "Haste makes waste." Haste causes many accidents. When you are in a hurry, you take chances that you would not take if you had plenty of time. When you are in a hurry, you are often troubled and bothered about other things and pay less

attention to where you are going. When you are going fast, you cannot stop quickly. The boy who ran into an automobile on his bicycle might have been able to stop or turn aside if he had been going slowly. The girl who sprained her ankle when stepping from a street car in motion probably was late and thought only of getting to the place to which she was going as soon as possible. There is a happy medium in speed of driving — not so slow as fourteen miles an hour, not faster than forty.

3. Fatigue. When workers in factories are tired, they have more accidents than when they are rested. When you are tired, you are less alert. You do not notice signs of danger. You do not think so quickly or make so accurate judgments. You do not "have your wits about you" so fully as when you are rested. The boy who fell from a ladder may have been too sleepy to see that it was securely braced. It takes keen, wide-awake people to avoid accidents in these days of speed. In order to avoid accidents, people have to see clearly, think accurately, and act quickly in hundreds of daily situations.

4. Worry and discouragement. Worry fills the mind with thoughts of the past and the future. Accidents happen in the present. Discouragement promotes a "don't-care-what-happens" attitude which may result in accidents. Some of the cuts and burns

in the list might easily have been due to worry or discouragement. They might have been avoided by wholehearted attention to the present situation.

Photo by H. Armstrong Roberts

What has good form in sports to do with accidents?

5. Lack of skill. Many of the accidents people have while playing games are due to lack of skill. The skilled player has control of his muscles. He sends the ball directly to the spot where it should go. He does not bump into other players. He does not fall down in a clumsy way. The skilled baseball player does not sling his bat away from him as he runs to first base. He drops it at his feet. The skilled volley-ball player does not hit another person in the eye. He has such control over his

movements that he hits the ball, not another person.

6. Lack of obedience to the rules of the game. Almost all games have rules that are safety rules. In hockey, for example, there is a rule that the hockey stick shall not be raised above the shoulder. What is the reason for this rule? What other rules in the games you play are safety rules?

Girls' rules for some games are different in certain respects from boys' rules. In girls' basketball, for example, the rules require the guards and forwards to stay within certain lines. Girls should use girls' rules in the games they play. In boys' basketball, the players may run all over the court.

7. Not heeding warnings. Why do you slip on ice, on a polished floor, or when you have on a new pair of shoes? If you looked closely at the pavement, you would see that it is not smooth. It has small ridges in it. Each time you take a step, the sole of your shoe rubs against this uneven surface. This rubbing causes friction. Friction holds the sole of your shoe to the street until you lift it up to take another step. But smooth things have little friction. Ice is smoother than the pavement. When you step on ice, there is little friction to hold your foot firm. To make matters worse, the rubbing of the shoe melts a little of the ice. These drops of water on the

ice make the friction still less. The sole of your shoe is no longer held down by friction. You slip and slide. Why do people put sawdust or ashes on ice?

A waxed floor also is very smooth. It has almost no friction. That is why a waxed floor is easy to dance on and hard to walk on. A bathtub, too, is rather smooth. When it is dry, it is not very slippery. When it is wet, there is a thin layer of water between the tub and your feet. Water has almost no friction. There is practically no friction to hold your feet to the tub. That is why it is easy to slip and hurt yourself in a wet tub.

Every slippery place, like every other dangerous place, should be a *warning:* "Take care!"

8. Alcohol. Alcoholic drinks are responsible for many accidents. In one city alone, during 1931, 1,000 pedestrians who were hurt in automobile accidents were reported as intoxicated. Physical defects and "driver asleep" were each reported less than one tenth as frequently as "driver intoxicated." One sixth of the causes for taking away drivers' licenses in one state were stated as "driving while intoxicated." Alcohol makes a person act less quickly than he usually does. That is one reason why accidents are more likely to happen when a driver has been drinking alcoholic beverages. He does not see danger quickly. He does not act quickly after

he sees the danger. Anything that makes a person careless, inattentive, or slow to act in case of danger may be the cause of serious accidents.

Prevention of Accidents

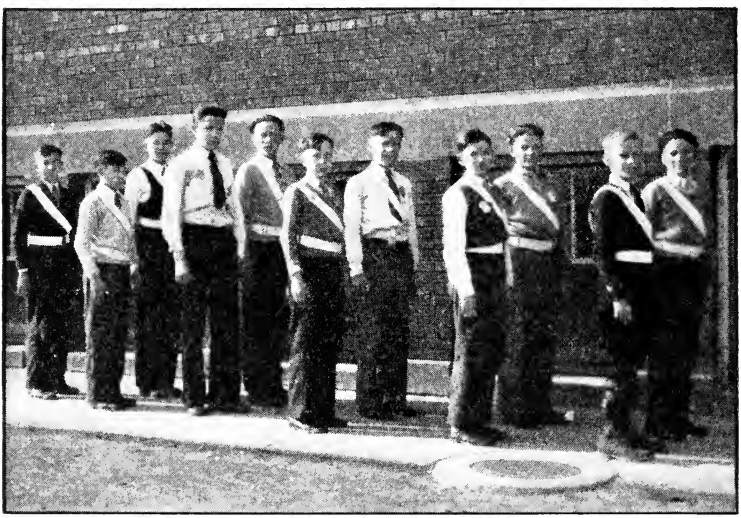
How can accidents be prevented? The causes of accidents point the way to their prevention. Read over the causes described on pages 127 to 133. Plan some way in which you can avoid every one of these causes of accidents. You can also teach safety to younger children in school and at home.

Perhaps you are a member of the Junior Safety Council in your school and wear the button, badge, arm band, or belt that is the mark of the Safety Patrol. The safety patrols stand on the curb to guard dangerous street crossings. They give *Stop* and *Go* signals to pupils crossing the street. They teach younger children to practice safety in crossing the street and in playing. They make safety seem a desirable and wonderful thing to all the children. They are courteous and helpful at all times. It is an honor to be chosen to act on the Safety Patrol.

The patrols have fun too. At their club meetings they often have motion pictures, shadow pictures, or slides showing "how to build and put out a camp fire," "what to do when you see a wire dangling," and other safety activities. Sometimes firemen, policemen,

doctors, and nurses tell them about safety and first aid. In some meetings they practice giving first aid.

In many ways driving could be made simpler than it now is. The colors of traffic lights could be made more easily seen by drivers. Information signs could



Courtesy National Safety Council

A safety patrol

be so plain that "those who run can read." Dividing lines could be painted on roads. Streets could often be widened. Road edges could be improved, thus making it less dangerous for a driver to move to the side of the road. Hand signals could be simplified and made uniform. Horn-tooting should not be substituted for careful driving.

How can forest fires be prevented? On the top of a high hill overlooking Glen Lake in Michigan is a small tower. From the top of this lookout tower one can see miles and miles of tree tops. Early

Photo by Acme Newspictures, Inc.

What is this lookout tower for?

in the spring the firewarden and his men climb into the tower and stay there night and day until the snows of the next winter cover the woodlands. From this tower they watch for the first sign of fire in the forests round about them. If they see smoke or flames, they at once telephone for help. In many

parts of our country firewardens are on guard and have prevented many serious forest fires. Observation airplanes are also useful for this purpose.

Our forests are not only valuable for the wood they yield. They also help to regulate the flow of streams, and they prevent the hillsides from being worn away by water. They should be saved. What can you do to prevent forest fires? What can you do to prevent other destructive fires?

Things to Do

1. If you are a Scout, read what your Scout book says about safety and first aid. Ask some of the boys and girls in your class to dramatize each of the safety activities described. For example, read about putting out a campfire. Then ask someone to show how he would do this. Read any books and magazines about safety which you can find in the library or which your teacher may have.

2. Make and carry out a plan for preventing accidents in school, on the way to school, at play, and at home.

3. Every week practice the best method of treating one of the common injuries.

4. What safety rules should you follow: (*a*) When you go swimming and boating? (*b*) When you are riding a bicycle? (*c*) When you are roller skating? (*d*) When you are making and leaving a campfire? (*e*) When you are walking along a country road? (*f*) When you are playing baseball? (*g*) When you are with animals? (*h*) When you

are riding horseback or driving a horse? (*i*) When you are using rings, swings, and other apparatus on the playground? (*j*) When you have been using tools at farm

Photo by H. Armstrong Roberts

What safety rules should you follow when you climb up or down steep hills?

work? (*k*) When there are small rugs on the floor, a hole in the carpet, or a broken step on the porch? (*l*) When you are climbing trees? (*m*) When you are working around

boiling water or other hot liquids? (*n*) When you are using matches? (*o*) When you are setting off fireworks? (*p*) When you are using gasoline or kerosene? (*q*) When you are using electricity? (*r*) When you are working or playing in places where poison ivy grows? (*s*) When you have an open fire in the fireplace? If no one in the class knows the best thing to do in any of these situations, look it up in a Scout book, in safety books, in safety magazines, or in booklets to be obtained from the National Safety Council.

5. Look over your home from top to bottom to see how many things you can find that might cause or increase the danger of fire, such as a closet filled with waste paper, oily rags in a heap, ashes put in a wooden or cardboard box. Tell your findings in class. Perhaps some of the other boys and girls will find fire dangers which you did not think of looking for. 6. As a class, study the safety problems of your school and neighborhood. Find ways of making your neighborhood safer for everyone. 7. Find out the traffic laws in your state and dramatize the most important ones in class.

TWENTIETH-CENTURY CRUSADERS

There are twentieth-century crusaders whose weapons are sunlight, fresh air, wholesome food, scientific methods of disease prevention, and consideration for the welfare of others. They have joined in a crusade against tuberculosis* and other

diseases. A few years ago attention was given chiefly to the person who was ill. Today we pay more attention to prevention.

Tuberculosis has always been one of man's most serious diseases. Robert Louis Stevenson, whose books *Treasure Island* and *Kidnapped* are probably favorites of yours, had tuberculosis. One hundred years ago if a doctor said of a person: "He has tuberculosis," it was almost the same as saying: "He is soon going to die." But today many people having tuberculosis are cured. Figures show that there are now only half as many deaths from tuberculosis in the United States as there were ten years ago. It may be, in time, that no one will have tuberculosis. That is an inspiring thought. Scientists are constantly trying to find a cure for this disease. School children can help stamp out tuberculosis by using the knowledge we already have. You are a soldier in a great crusade. Tuberculosis and other diseases can be completely conquered only when all the people work together under able leadership.

What causes tuberculosis? The cause of tuberculosis has long been known. A small germ, the tubercle* bacillus,* causes tuberculosis. You cannot see it without a microscope. These tiny bacteria are like people in many ways. They "breathe" oxygen. They give off carbon dioxide. They require warmth.

They need food. Tubercle bacilli thrive on the same things that keep people alive. That is why they grow so rapidly in the human body.

The bacteria that cause tuberculosis are killed by boiling water and direct sunlight. They are also killed by certain chemical substances such as iodine. But whatever kills the bacteria usually injures the tissues of the body. That is why it is so hard to get rid of tubercle bacilli once they have found a lodging place in a person's body.

Poor food, fatigue, and exposure to wind, cold, and wet do not *cause* tuberculosis. But these conditions probably help bacteria to get a foothold in a person's body. In other words, malnutrition and poor hygiene increase susceptibility* to tuberculosis. Some people seem to be born more susceptible than others. When the tubercle bacilli gain entrance to the body, such people are more likely to get the disease than are people who are less susceptible.

How may tuberculosis be prevented? The prevention of tuberculosis begins at home. It is a family disease. Sometimes whole families have it. Why does tuberculosis run in families? It is not because the disease itself is inherited from the parent by the child. Babies are not born with tuberculosis. Children may be born, however, who are especially susceptible to it. Children often get it as they grow

up in families in which a father, mother, aunt, grandfather, or grandmother has tuberculosis. Every tuberculosis case comes from another. The tubercle bacilli are found in large numbers in the material from the nose and throat of people who have tuberculosis. A person need not be very sick with tuberculosis in order to spread the bacteria. Even a person who shows no signs of the disease may carry the bacilli in his nose and throat. Such a person is called a *carrier.** Tuberculosis is developed only when tubercle bacilli are present. Therefore, one way to win the fight against tuberculosis is to prevent the bacteria carried by one person from reaching other people, especially children.

Since the chief way in which the tubercle bacilli are passed from one person to another is in the discharges from nose and throat, what should be done? Prevention seems simple.

A person who has tuberculosis should:

1. Kill all the bacteria as soon as they come from his nose and throat. How can this be done? By spitting into a little paper cup or paper handkerchief. By blowing his nose on paper handkerchiefs. By burning these paper cups and paper handkerchiefs promptly. No bacteria can live in flames. Instead of doing these easy, simple things, what do careless people sometimes do? They spit on the sidewalk or

even on floors where people walk and little children play. Tubercle bacilli will live in sputum* (material coughed up from the lungs) for more than an hour even when they are exposed to bright sunlight. This sputum, not yet dried, may stick to the shoes of a father going home from work. Some of it may brush off on the carpet. His little baby is just learning to creep. When creeping around the floor, the baby may get some of the bacteria on its hands. At that age, the baby naturally puts his fingers and other objects in his mouth. He may become infected* with the tubercle bacilli.

2. Not allow the bacteria to pass directly to other people when he is talking to them. Not kiss them. Always cover his nose and mouth when he sneezes or coughs. If one member of a family has tuberculosis, it is often easier to prevent the spread of the tubercle bacilli in his family by going away to be cured. If he stays at home, he should sleep in a room by himself, use his own towels, and have his sheets, towels, underwear, silver, and dishes boiled and kept separate from those used by the rest of the family.

3. Keep his hands and other objects away from his face. Perhaps, this morning, you have sat chewing your pencil while you were wondering how to do an arithmetic problem. Explain how that habit may lead to tuberculosis or other diseases.

4. Wash his hands and face before eating food. He should not prepare food for others. Food should be always prepared by cleanly, healthy people both in the home and in all public eating places.

Catch a sneeze so that someone else will not catch a cold.

5. Protect food from flies. It is not only people who spread bacteria. Flies are also guilty. In some communities flies are seldom seen. People have successfully waged war against them. They have taken away piles of manure in which flies breed —

that is, lay their eggs and hatch their young. In this way they have prevented millions of flies from being hatched. It takes about ten days for a fly to grow up. If the manure cannot be carted away promptly,

Why is washing the hands one form of health insurance?

it can be treated with chemicals which destroy the flies' eggs or the flies in the early stages of their lives.

These are the chief ways of preventing the spread of tubercle bacilli. All five are simple things to do.

And yet these simple habits may make the difference between sickness and health; sometimes between life and death. Some of them are a part of good manners.

Tubercle bacilli are also sometimes found in the milk of cows who have tuberculosis. Our public-health services see that milk from diseased cows is not used. Every year very many cows are tested to find if they are free from tuberculosis. A final protection is pasteurization.

Photo by H. Armstrong Roberts

Health and a good sport

Is checking the spread of tubercle bacilli all you can do in this crusade against tuberculosis? No, because in preventing tuberculosis good health has a part to play. Even though

bacteria get into the nose, throat, and lungs, a healthy body is usually able to resist them.

The boy or girl in a temperate climate who is out of doors two or three hours every day in the sunlight, wearing no more clothing than is needed to keep warm; who eats healthful meals, such as you have already learned to plan, and at regular times in a cheerful and unhurried way; who rests when he or she begins to feel tired; who sleeps ten or eleven hours at night; who drinks four glasses of water a day; and who always practices the simple but essential habits of washing the hands before eating and keeping them away from the face is helping to protect himself against tuberculosis.

Can tuberculosis be cured? Tuberculosis can often be cured if it is discovered early. It can best be discovered in two ways: (1) by a special test called the tuberculin* test which shows in most cases whether a child has been infected with the tubercle bacilli; (2) by an X-ray* examination of the chest following the tuberculin test in selected cases. Some schools are already giving their students these two advantages. It is important to have an examination every year because tuberculosis is most easily controlled when discovered early. If active tuberculosis is discovered, treatment should be begun immediately. The patient is given rest, and more

rest, and still more rest. At the same time he enjoys fresh air and wholesome food.

Many people recover from tuberculosis; but it is better to prevent it than to have to cure it. "An ounce of prevention is worth a pound of cure."

Can you use any of these facts about tuberculosis now? Perhaps you know someone who coughs a great deal and is thin and tired. You can advise him to see a doctor. If you have a baby in your family, you want to protect it from all kinds of danger. It is too little and helpless to protect itself.

The same habits which help to prevent tuberculosis also help to prevent measles,* whooping cough, scarlet fever,* and other communicable children's diseases. People used to think it was a good thing for their children to have the so-called "children's diseases" when they were little and thus acquire immunity* to them. But that is a false notion. It is not desirable to have any of these diseases. They may affect the heart, the sight, or the hearing. They make it easier to catch still more serious diseases. The same good habits which help to prevent tuberculosis and childhood diseases are an aid against colds also.

Things to Do

1. Read the story of another health hero — Edward Livingston Trudeau. This is the story of a man whose

beloved brother died of tuberculosis and who himself had tuberculosis. He cured himself by living in a healthful way in the mountains, and he built a famous sanitarium* where people who have tuberculosis come to be cured.

2. Did you wash your hands before lunch today? Yesterday? Did you cover your mouth and nose with a clean handkerchief when you coughed or sneezed? Why are some simple habits so hard to form? Perhaps you have learned to play the piano or the violin, to swim or ride horseback, or to typewrite. These are all difficult skills to learn. You can surely learn the simple skills of disease prevention. Set yourself a goal this week to form, if you have not already done so, the habits (*a*) of keeping your fingers, pencils, and other objects away from your face and out of your mouth; (*b*) of washing your hands and face before touching food; and (*c*) of covering your nose and mouth when you sneeze or cough.

3. Ask your class teacher or your science teacher to help the class prepare four small covered glass dishes of material in which bacteria grow well. Such materials are called culture* media.* Gelatine is often used. When this method of studying bacteria was first described by Dr. Robert Koch, the great Pasteur, who was in the audience, rushed up to Dr. Koch, shouting enthusiastically, "C'est un grand progrès!" (This is a great advance!) Using this method scientists have discovered many of the microorganisms* which cause well-known communicable diseases. Perhaps in your classroom you can perform the following experiments:

Dish I: Wash the end of your pencil in a little water which you have boiled and cooled. Put a drop of this water on the culture medium in the first dish.

Dish II: Cough or sneeze over the culture medium in the second dish.

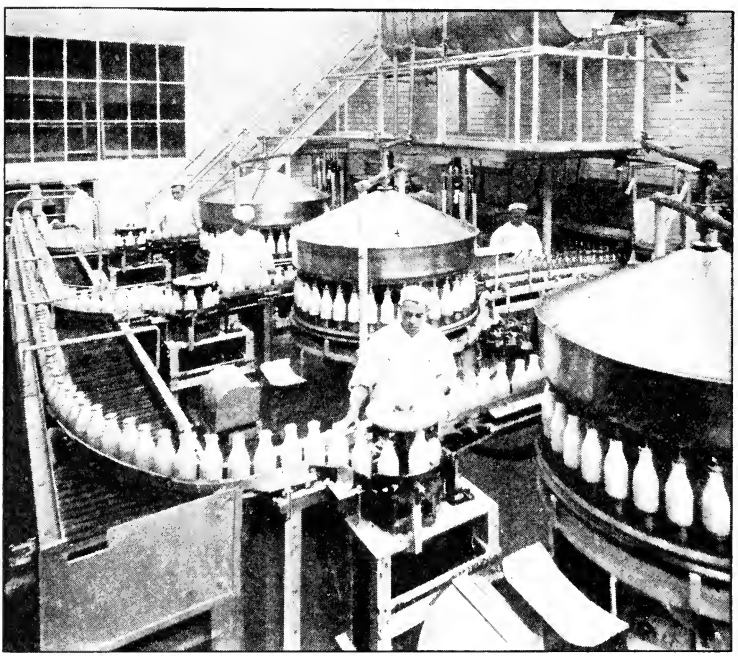
Dish III: Rinse one of your fingers and clean the nail in a little water which you have boiled and cooled. Put a drop of this water on the culture medium of the third dish.

Dish IV: Keep this dish covered all the time.

Put the four dishes in a warm place. Look at them after two days. What do you see? Do you find spots on some of the culture media? These spots are colonies of bacteria — hundreds and thousands of bacteria close together. Otherwise you could not see them. Where did they come from? What kind of bacteria are they? You cannot answer the last question without a powerful microscope and a great deal of study. Many of these bacteria are harmless. But there may be in the colonies germs which might cause colds. There may be some which might cause typhoid fever* or other intestinal* diseases. What does this experiment show about the importance of keeping pencils, fingers, and other objects out of the mouth? About washing the hands and face before eating, and about covering the mouth when you sneeze or cough? Read about bacteria in other books.

4. Visit a food factory in your neighborhood if you may, and take note of all the things the workers do to prevent bacteria from getting into the food they are preparing.

5. Find out the laws regarding pasteurization of milk in your community. What are the conditions under which certified "raw" milk and grade *A* pasteurized milk must be produced and handled? 6. If you see some one wet-



Courtesy Sheffield Farms Co., Inc.

Bottling pasteurized milk

ting his fingers to turn the pages of a book, show him politely how easy it is to turn pages by using the soft eraser on the end of a pencil. 7. Make a set of cartoons or drawings showing ways in which you can prevent bacteria from getting into the body.

8. If you are studying Africa, the Panama Canal, Brazil, or other countries where malaria* and yellow fever* were common, read about the causes and prevention of these diseases. Except for the mosquito, the Panama Canal might belong to France. The French workmen who tried to build the canal were defeated by disease. By the time the United States undertook the task, first steps in the conquest of yellow fever had been taken. The story of the conquest of yellow fever tells about another health hero — Walter Reed. Find in the library, if you can, a book that tells his story.

9. Are colds or tuberculosis problems in your school? If they are: (1) state the difficulty clearly; (2) find out the facts you need to know about the problem; (3) learn the facts about your school; (4) work out the changes which should be made and the means of making these changes; and (5) carry out the plan you have made as far as possible. With the help of the older people you may later do the same for your community, if it is not a very large one. **10.** Find out the number of boys and girls in your class who have had a health examination this year: What percentage of the class have had one? Why is an annual health examination important? **11.** Look up *sunlight* in the index of this book. Turn to the pages on which the word *sunlight* is found. Write in an interesting way the facts about sunlight which you find.

12. Make a list of all the things your town or city does to improve health. What does the United States Government do to help you to keep well?

WHEN YOU TAKE A DRINK OF WATER

There is one thing you need wherever you are. You need it at home and at school. You need it when you go camping or when you take a long walk. You need it when you are taking a day's trip on a train. What is it? You have probably guessed the answer — water. A loss of 10 per cent of the water in the body is serious. A loss of 20–22 per cent means death.

That is why men, from the earliest times, have always been concerned about water. They have always built their homes near rivers, or lakes, or on oases. Today they store up water in great reservoirs for the use of large cities. Even animals know where the water holes and other sources of fresh water are. The camel has a stomach of several pockets, or cells, which, somewhat like a sponge, will hold enough water to enable it to go many days in the desert without drinking.

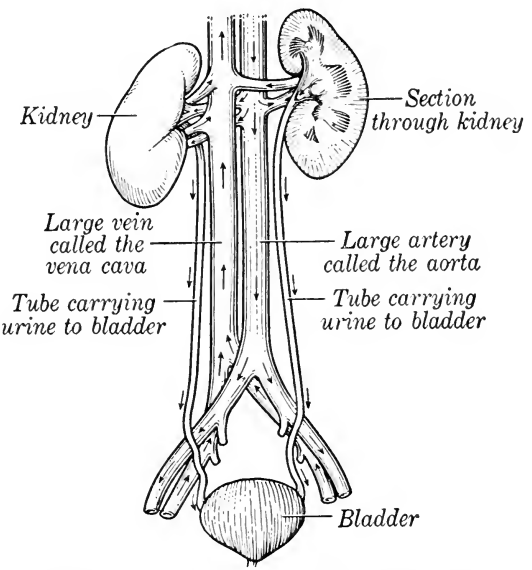
The Body Needs Water

Why is it impossible to live without water? Why do plants and animals and human beings all need water? Water is essential for digestion of food, circulation of the blood, elimination* of waste, and all the other processes of living.

About 58 per cent of the weight of the human body is water. If you weigh 100 pounds, you are about 58 pounds water. The blood is 75 to 80 per cent water. Water is stored in the spaces between body cells. It is drawn forth from storage as it is needed to keep the percentage of water in the blood always the same. Drinking a large amount of water does not thin the blood. The extra water is stored in the tissue spaces or eliminated* by the kidneys. Water makes circulation of the blood possible.

In the process of digestion, all the food must be dissolved and changed before it can be used by body cells. Water is the great solvent.* Have you ever put salt or sugar in water and watched it disappear? Salt and sugar quickly dissolve in water. Water dissolves salt from the earth and carries it to the ocean. That is why the ocean tastes salty. Ocean water contains iodine which has been dissolved from the land. Water dissolves iron and calcium and other minerals in the soil so that plants may pull them up through slender stems and use them for food. Water helps to dissolve our food, for it is a part of all the digestive juices which help to change food into soluble* form. Without water, the waste products of the body could not be washed away. Water also is important in carrying certain body wastes out through the kidneys.

The kidneys are small organs, only about four or five inches long and one and a half inches wide. Like the heart they do an almost unbelievable amount of work. They help remove body wastes. A steam engine at work always leaves wastes, such as smoke and ashes. When the body cells work — and they are working as long as they are living — waste products are also given off. The kidneys are of great importance in removing waste substances carried from the body cells by the blood. This process of removing waste products from the body is called *excretion*.* Carbon dioxide leaves the body by way of the lungs; water and salts are excreted by the



Elimination of waste through the kidneys

Find the blood vessel that brings blood to the kidneys. What is it called? Find the blood vessel that carries blood away from the kidneys after the impurities have been taken out. What is it called? Find the tubes that carry urine to the bladder.

skin; and the solid wastes of food, bacteria, and certain salts are excreted from the large intestine. With these exceptions almost all the waste products of the cells are excreted by the kidneys.

Part of the alcohol in wine, whisky, and other alcoholic* beverages is also excreted by the kidneys. When a person drinks an alcoholic beverage, about 20 per cent is rapidly absorbed* by the stomach. The other 80 per cent is less rapidly absorbed in the small intestine. About 95 per cent of the alcohol taken into the digestive system is changed to other substances; the other 5 per cent is excreted by the kidneys and lungs unchanged. Thus you can see that the organs of excretion as well as the organs of digestion are affected by alcohol. The blood vessels of the kidneys of the person who habitually drinks a great deal of alcoholic beverages (the *chronic alcoholic,* as he is called) may have some of their muscle cells replaced by fat cells. This *fatty degeneration** (as it is called) in the blood vessels of the kidneys is somewhat like that often found in the liver and heart of the chronic alcoholic.

The poisons made by bacteria may be another source of harm to the kidneys. Severe blows may harm the kidney cells and interfere with their work. Sudden chilling or exposure to cold may interfere with the work of the kidneys by causing inflammation* in

them. Poor posture may make the kidneys sag and so interfere with their blood supply. Since the waste products are carried away by the blood, you can easily see that a free circulation of blood through these organs is important.

The caffeine in tea and coffee stimulates* the kidneys and may possibly injure these organs. As the blood circulates through the kidneys, they snatch from it, as it flows by, substances which the body does not need or which may be harmful. The scientific name for this solution of useless and harmful substances which have been separated from the blood by the kidneys is *urine.** Substances which dissolve with difficulty need a large amount of water to remove them completely. Water is essential to the work of the kidneys.

The liver is a strong ally of the kidneys. It changes certain poisonous wastes to substances which the kidneys can remove without being injured. In a thorough health examination the doctor usually has a urine analysis* made. By means of chemical tests the substances which the kidneys are removing or failing to remove from the blood are discovered.

The urine drops down into the bladder.* The bladder is a muscular bag. Its purpose is simply to hold the urine for several hours at a time until the

person is ready to urinate* — that is, pass it out of of the body. The drawing on page 155 shows how the kidneys are connected with the bladder. The bladder, in which the urine is held, may be irritated by concentrated urine, that is, urine which has not been thinned sufficiently with water.

A very, very small amount of body waste is washed out through the skin in perspiration.* But since the perspiration is over 99 per cent water, you can see that it does not carry much waste material from the body. Perspiration is more important in keeping the temperature of the body the same all the time whether the day is hot or cold.

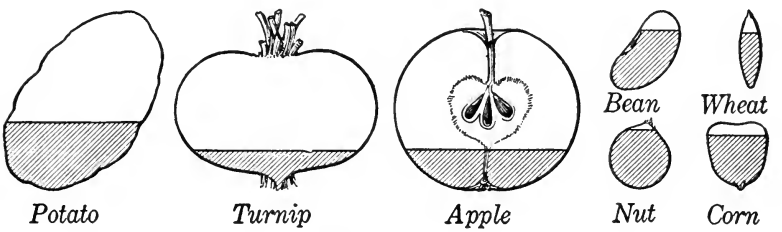
It is not only the inside of the body which needs water. Water is needed on the outside, too. You need water to keep your body and your clothes clean and for preparing and cooking food.

Wash thoroughly fruit and vegetables which you eat raw. It is still safer to pare apples and pears which may have been sprayed with arsenic* to kill insects on the trees. The ends of the fruit, where the largest amount of spray collects, should be cut away.

People in different parts of the world use different amounts of water. Each person in India uses, on the average, about a quart of water a day. The average amount of water used per person in San Francisco is 81 gallons a day; in New York City, 131 gallons;

and in Chicago, 275 gallons. Some of this water is wasted; some is used in cleaning houses, washing streets, carrying wastes down toilets, and watering gardens; some is used in factories. Think of all the ways in which water is used in your neighborhood.

How much water should you drink daily? The amount of water you need depends upon a number of



Water in food

The white part shows the amount of water. What per cent of each of these foods is water?

things — how hot the weather is, how much you are perspiring, and how much water is in the foods you eat. More water is poured out through the pores in the skin during hot weather than in cold weather. This water evaporates from the skin, drawing away heat as it evaporates. That is how perspiration helps to cool the skin.

There is a large amount of water in the food you eat. The pictures on this page show how much water there is even in foods which seem dry. Milk, soup, fruits, and vegetables supply a great deal of water.

In addition to the water in foods, you probably need at least four glasses of water a day.

Some people say that drinking large amounts of water will prevent kidney disease. There is no proof of this. In fact, forcing yourself to drink more than the average of four to six glasses a day may put extra work on the kidneys. The most healthful thing used in excess may become harmful. "Nothing in excess" is a good rule. It is usually a good plan to drink a glass or two of water when you get up in the morning, another glass in the middle of the morning, and still another glass in the middle of the afternoon.

Drinking water at meals in the proper way aids digestion. Drinking water with meals aids the tissues in satisfying their need for water. Perhaps you have heard people say that you should not drink water with your meals. This is not true. Water at meals is harmful only when it is used to wash down partly chewed food.

Safe Water Supply

How much does a glass of water cost? Some of you will answer: "Nothing." That is true in a few places where safe water bubbles up from a spring. But in almost every place water costs something. The story is told of a merchant traveling through the desert, his water supply gone, who paid for a drink

of water in diamonds. The glass of water which you get from your own well or pump costs very little — just a fraction of the first cost of the well or pump. Perhaps your father pays a water tax. Ask him whether he does. This tax helps to pay the cost of providing safe water for all the people.

Where can you get safe water? Since everyone must have water, it is very important to make it safe, no matter how much it costs. Safe water is always cheaper in the end than sickness. Bacteria which cause disease find their way into drinking water in hundreds of ways. But there are just as many ways of guarding against them. The town or city or county government plays a part in making water safe. The school has its responsibility. Your father and mother have a part to play. You have a share, too, in securing safe water.

If you live in a city, you depend upon the city to supply safe water. All cities today make sure that the water is safe to drink. Most cities filter* the water and treat it with chlorine. Filtering strains out dirt of all kinds. Chlorine kills bacteria quickly. You can sometimes taste the chlorine in the water of cities which use this method of making water safe. But commonly city water tastes like cool spring water from high up in the mountains.

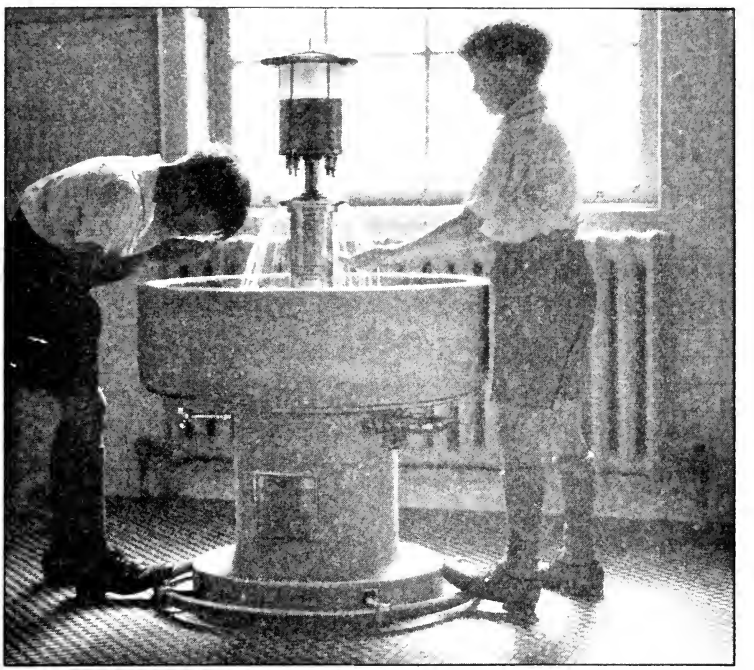
Columbia, Missouri, pumps its water from eight

deep wells made by drilling (in the case of one well 1200 feet) down through the rock to a layer or stratum of sandstone which runs underground 70 miles from the Ozark Mountains where the water enters it. Water travels in this layer very slowly. Probably years ago the water which people drink today in Columbia fell as rain in the Ozarks and began its slow journey through the rock. Why is this water likely to be pure?

The school has an important responsibility in providing safe water for pupils and teachers. In the first place, a safe source of water must be found. In the second place, the water must be used in a safe way. Two safe sources of school water are a city supply and a good well. The city water supply has already been described. A carefully built well is one which will not let dirty water drip through the cover or slip in at the sides. A well should not only be carefully built; it must also be so placed as to avoid pollution* from toilets and barnyards.

The deeper the well, the more likely the water is to be safe. Do you see how wells that draw their water close to the surface of the ground might be unsafe? Wastes from the bodies of people are sometimes buried in or thrown on the ground. These wastes may contain bacteria which cause disease. The rain falls on the earth. It carries impurities down into the

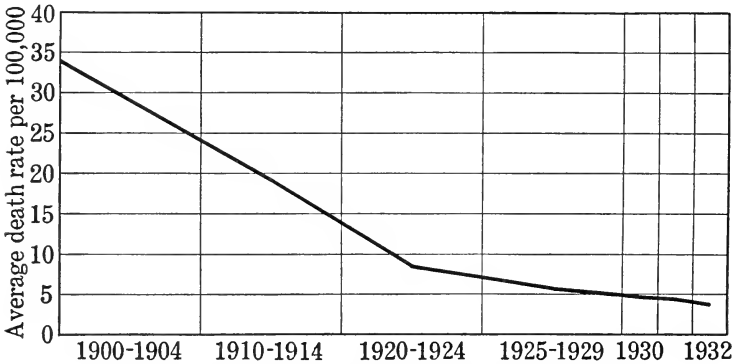
ground with it. A shallow well is likely to yield water into which bacteria have been washed. But as the water oozes farther and farther down into the



Point out three things that make this school wash basin thoroughly sanitary.

earth through layers and layers of sand and other kinds of soil it loses its load of bacteria. The sand acts as a filter. That is why deep wells are likely to be safer than shallow wells.

After the school has secured safe water, it should be careful to keep it safe. Every child should use his own cup. Paper cups which can be used once and then thrown away are excellent. If the school has drinking fountains, they should throw the water at an angle — not straight up in the air. The holes from



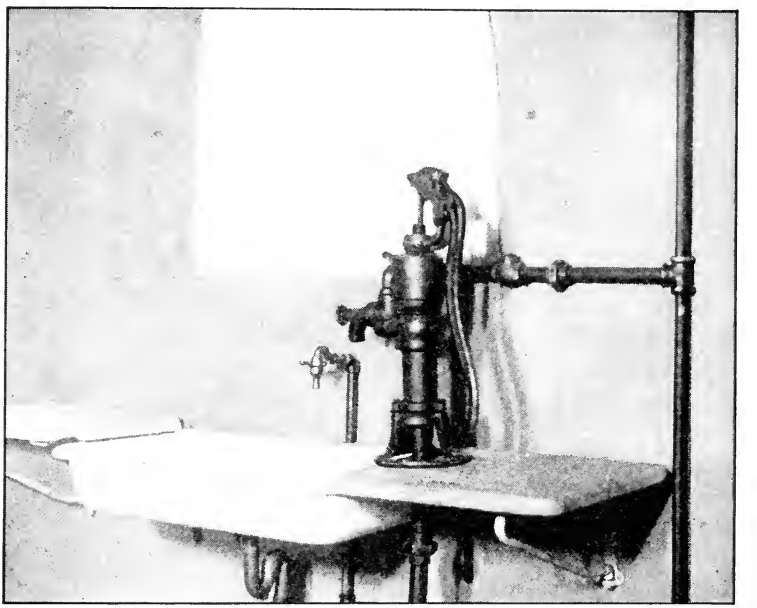
Typhoid fever is disappearing in the United States

Can you explain the decrease in death rate from 1900 to 1932?

which the water comes should be guarded by a heavy wire so that children's lips cannot touch the bulb as they drink. Can you give reasons for these two requirements of a sanitary drinking fountain in the school?

The school should provide soap and water for washing the hands before lunch and after going to the toilet. No school is a truly up-to-date school which does not do this. At home, as at school, there should

be a safe water supply used in a sanitary way. People used to drink water from rivers, but they found that they were often drinking, at the same time, bacteria which cause disease. Typhoid fever has often been



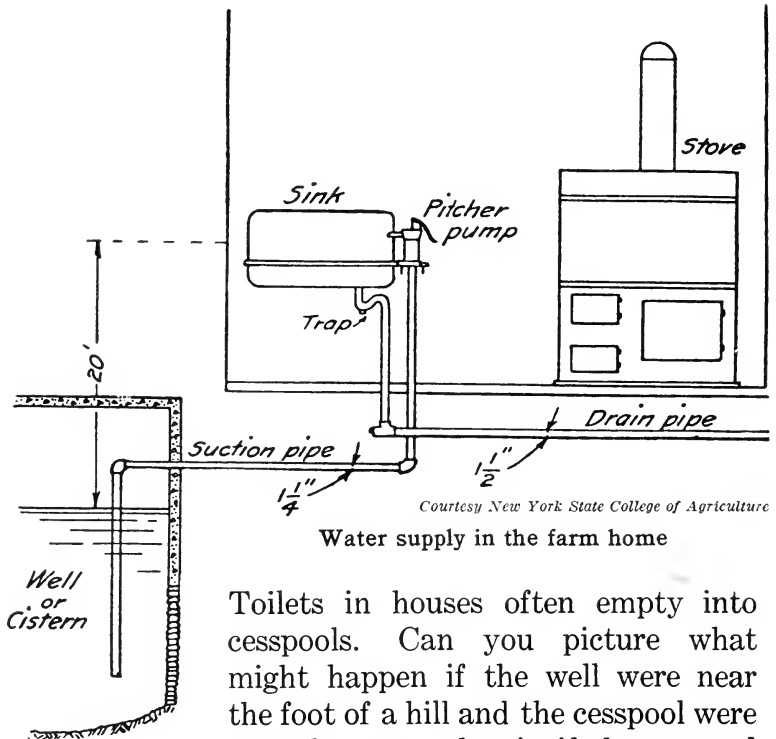
Courtesy New York State College of Agriculture

A convenient water supply for a country home

spread by sparkling river water. The number of cases of typhoid fever has been greatly reduced by making the water supply safe.

The pictures on this and the following page show how water may be supplied in the farm home. Do you have a pump which draws water from deep down

in the ground? Is your well placed on higher ground than the cesspool and barnyard? The cesspool is a sort of walled-in hole into which wastes are sent.



Courtesy New York State College of Agriculture

Water supply in the farm home

Toilets in houses often empty into cesspools. Can you picture what might happen if the well were near the foot of a hill and the cesspool were near the top — that is, if the cesspool were higher than the well?

If you are not sure that the water you have is safe to drink, boil it and cool it before you drink it. This has been done for hundreds of years. More than

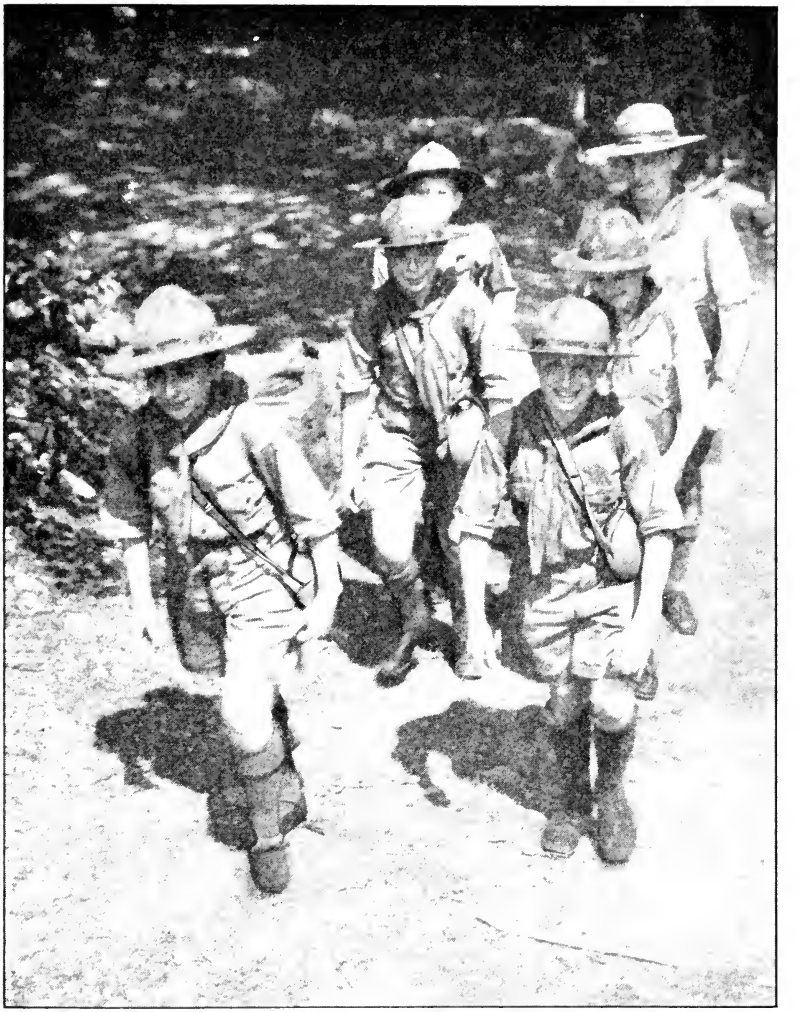


Photo by Boyd Parker

Scouts carry canteens. Why?

twenty-five centuries ago, a great general and king of Persia boiled the water which he drank. The Chinese and Russians still boil their water to make it safe to drink. Some American families today boil their drinking water, keep it in clean, covered glass bottles, or jars, and use it whenever they feel thirsty.

When you go camping or on an all-day walk, are you very careful to have safe water? Sometimes you carry drinking water with you — a good plan. You have learned never to drink from brooks or old wells along the way. That is one of the first rules of camping.

Things to Do

1. If you are interested in different kinds of pumps and how they work, read Chapter II in Bigelow and Broadhurst's *Health in Home and Neighborhood.* You will enjoy reading all of this interesting chapter.

2. Make a poster showing the most important ways of keeping drinking water free from bacteria.

3. If you were moving to a new home in the country, what questions would you ask about the water supply? Ask these questions about the water supply in your present home. Talk over with your father and mother changes which should be made if the water you drink is not easy to get. Are there any difficulties in the way of washing your hands before eating and after going to the toilet? If there are, make a plan to overcome these difficulties.

Carry out your plan. **4.** How might dangerous bacteria get into river water? Draw a series of pictures illustrating this. **5.** Read about water supplies in your history and geography books. How do cities near you supply safe water for their citizens?

6. Study the water supply in your school. How many of these questions can you answer by "yes"? Is it easy to get a drink of water whenever you feel thirsty? Does your school have a well? Is the well at least 100 feet from a toilet and located so that the contents of the toilet cannot drain into the well? Has the state department of health recently said that the water was safe? If drinking water is carried to the school, is the pail or other vessel covered? Are individual drinking cups or a drinking fountain provided? Are there any chances for bacteria to get into the water supply? Are wash basins, individual cakes of soap, liquid soap or powdered soap, and clean towels supplied? Are paper towels used? Or does each pupil have an individual towel? Are there any changes which you think should be made in your school in order to have a better supply of water for washing and drinking?

7. Why does boiling make water safe? Why is it not necessary for each family to boil their drinking water in a large city such as Chicago?

8. Test your toothbrush on these points: Is it small enough to get around and behind all your teeth? Are the bristles stiff enough and far enough apart to get between your teeth? Is it dry and clean when you use it?

"HE'S STRAIGHT"

Have you ever heard the expression: "He's straight"? It means, "He's honest. You can trust him." People who *stand* straight usually give the impression of *being* straight. What first impression do you have of a new boy or girl in school who "stands tall" and in excellent posture?* What first impression do you have of a boy or girl whose head drops forward and whose shoulders are rounded? Have you ever thought that your posture affects other people in the same way that their postures affect you? Employers often judge boys and girls who apply for work by the way they sit and stand and walk. When employers and other people see a boy or girl who sits and stands well, they think: "He is alert"; or "She is a capable person"; or "I think he will do good work"; or "Good health and good posture often go together"; or "It does me good to look at her." Sometimes a really capable person loses a good position just because his posture gives the impression that he is careless and sloppy. Can you afford to make a poor first impression?

What are some other advantages of good posture? In addition to the good first impression which excellent posture makes, it has many other advantages. It helps to give you greater confidence in yourself.

You usually feel more alert and have greater self-respect when you are sitting and standing well.

Good posture not only makes a person *look* more capable; it helps to *make* him more capable. Work

Is this young woman making a good first impression in applying for a position? Why?

of any kind can be done more easily by a person who carries himself well. Poor posture and fatigue go hand in hand. Fatigue leads to poor posture, and poor posture is fatiguing. You not only slump into poor posture when you are tired, but you become

tired when you sit and stand and move about in poor positions. Most coaches of athletic* teams choose players who have good posture. They believe they will be able to play the game with greater ease and skill.

The effect of very bad posture on the lungs and other organs is well known. Rounded shoulders and

How animals would look if they walked like some men

How man would look if he walked like animals

a slumped position may interfere with the lungs in breathing and crowd other organs out of their natural places. There is evidence to show that digestive disturbances and failure to gain in weight are also sometimes related to poor posture. In some cases weight has increased and digestive disturbances have decreased when posture was improved. Good posture may also aid regular daily bowel movements.

Courtesy Bryant Baker, Sculptor

The pioneer woman

What first impression do you get from the posture of this woman and her son?

How can you learn to stand up straight? Can a person who has had the habit of bending over for many years ever straighten up? Certainly. There are many ways of improving posture. Some of the commands given to encourage good posture are helpful. "Brace!" That is what West Point men used to say to their classmates to remind them to sit and stand up straight. But there is one danger in this word *brace*. Say "brace" to yourself now. What did you do? Did you stiffen your muscles and throw back your shoulders? That is the danger in the command to brace. Good posture is not stiff posture. Good posture is a comfortable way of sitting, standing, and moving.

The first suggestion for forming the habit of good posture is to learn good form in lying down, sitting, walking, working, and playing games. Look at pictures of people who are standing and sitting well and of people who are standing and sitting poorly. Which do you wish to look like? Look at yourself in a long mirror. Stand and sit in the way you usually do. Are you satisfied with your posture?

Now stand, giving attention to each of the following points:

Weight forward and on the outer borders of the feet, toes pointing straight ahead. Knees relaxed — "knees easy" — chest up and forward. Head high,

chin in. Are you "standing tall"? Do you feel comfortable?

Now sit, giving attention to each of the following points:

Feet on the floor — heels and toes both resting on the floor; thighs and legs making a right angle at your knees; chest up and forward; lower part of the back touching the back of the chair; bending slightly forward from the hips; head high, chin in. Are you "sitting tall"? Do you feel comfortable? Do you look alert, capable, and interesting when you stand and sit according to these directions? Do you also feel alert?

A correct sleeping posture is one in which you are stretched out, not curled up like a cat. No pillow at all should be used if you sleep on your back. A small pillow may be used if you sleep on your side.

While you are forming habits of good posture, think of good posture often. Give yourself correct commands and obey them. Check your posture to see whether you are standing correctly from your feet to the top of your head and whether you are practicing good form in every activity. After you have formed these habits, you need no longer think about posture.

Every kind of game can be played in good form or in poor form. Do you know what is good form in

the games you play? Look at the pictures in this chapter. They show good form in several kinds of outdoor play. Try to imitate them whenever you are engaging in the same activities. Skill in sports

Good form in playing ball

is about the same as good form. Good form requires the correct posture for each activity.

Exercise may be healthful or harmful. It is healthful when it is a suitable kind of exercise for you and when you have learned the correct form. It may be harmful if it is done awkwardly and with a feeling of

strain. It is an aid to good posture to do suitable exercises to strengthen the muscles which hold the body in an upright position. Your physical-education teacher will give you exercises of this kind.

But it is not enough to want to have good posture and to practice sitting, standing, and playing in the correct positions. If your muscles are weak, you will not be able to hold these positions. The second suggestion for achieving good posture is to eat the right kind and amount of food. Good posture depends, in part, upon strong muscles. Strong muscles depend, in part, upon the right kind and amount of food. Muscles may also be strengthened by playing active outdoor games and by special exercises. During the World War many soldiers, who had stood and walked poorly when they joined the army, after six weeks of training gained good posture and had excellent command of their muscles.

A third suggestion for those who would have good posture is to avoid getting very tired. Fatigue is often the beginning of poor posture. Many people have formed the habit of sitting poorly by staying up late in the evening when they were tired enough to be in bed. Most boys and girls who are twelve to fourteen years old need ten to eleven hours' sleep.

A fourth suggestion is to choose chairs and desks of the right height. Your chair should be of such a

height that your feet can rest comfortably on the floor. Your table or desk should be of such a height that your elbows are at the level of the desk when

Photo by Ewing Galloway

Skating strengthens many muscles and helps posture.

you are sitting with your arms hanging naturally at your sides. Find a way to make the furniture fit you.

A fifth way to encourage good posture is to find work that you can do well and then give your attention wholeheartedly to it. You can often tell when a person is discouraged by the way he sits, stands, or

walks. Success aids posture. How do you stand when you get 100 per cent on your arithmetic paper? There is a story of a Frenchman who had very poor posture. His wife brought him to the doctor. The doctor gave him a medal of honor to wear, and the man at once began to stand up straight. His poor posture was cured by increasing his self-confidence.

Things to Do

1. Help someone you know to form the habit of sitting and standing in good positions. 2. Take photographs of some of your boy and girl friends. See how many of them naturally sit, stand, and walk in good positions. With their permission make an exhibit of these pictures. Help those who have poor posture to improve. 3. How are you sitting now? Are your heels and toes resting on the floor? Is your head high and your chin in? Do your knees form a right angle with your legs and thighs? Is the lower part of your back touching the back of the seat? Are you holding your book up at least twelve inches from the eyes? 4. Ask your teacher to give you a posture test and suggestions for improving your posture.

BRINGING UP THE BABY AND SMALL CHILDREN

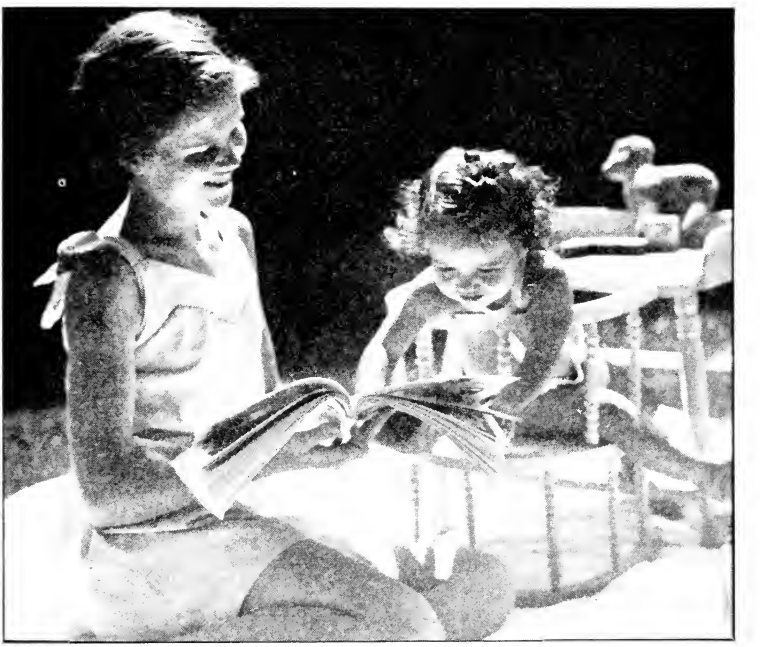
Boys may say when they begin to read this chapter: "This is just for girls. We are not interested in babies. Caring for babies is girls' work." But if

they will read the chapter carefully they will soon see that big brothers are very important to little brothers and sisters. There are many good turns that older boys can do every day if they have younger brothers and sisters.

Boys and girls in the upper grades of school seldom realize how much influence they have on their younger brothers and sisters. The future health and happiness of the baby may depend upon the way he is treated during the first years of life. You can be an influence for good in your family in at least four ways: (1) by helping your mother take care of the baby so that she will have more time to herself; (2) by knowing what to do for the baby in case your mother has to be away from home for a short time; (3) by not making a noise or trying to play with the baby when doing so would disturb his sleep; and (4) by staying away from him when you are ill.

Some schools have clubs for girls called *Little Mothers' Leagues*. In the club meetings a nurse or home-economics teacher shows the club members how to bathe the baby, the kind of clothing he should wear, the kind of food he should have, and other interesting things about the care of the baby and children not old enough to go to school. In a few schools boys learn these things, too. Some older boys and girls earn money by taking care of the neighbors' children for

an hour or two when the mother has to be away or is busy with other things. Many college girls earn part of their college expenses in this way. Some people's life work is the care of young children.



THE CHILD'S DAY

What should you do if the baby cries? If the baby begins to cry, the first thing most people want to do is to pick him up and soothe him. The baby likes that. But it is not always the best thing to do.

Some clever little babies have discovered that they will get attention if they cry. They have found that crying brings mother, father, sister, or brother running. They like attention. So they cry. The best thing to do if the baby cries is to be sure that a pin is not sticking into him, that he is dry and comfortable, and that he is not sick. A sick baby may have a cough, a running nose, or a rash (a breaking out) on his skin. His face may be unusually cold and pale or unusually hot and red.

If you are sure there is nothing serious the matter with him, go away again. Leave him alone even though he continues to cry. Do not pick him up. Do not rock him or fuss with him. If you do, the baby will learn to cry every time he wants attention. Above all do not give him anything to put in his mouth, such as a pacifier.* A pacifier may be harmful in many ways: It carries germs; it wastes saliva; it may change the shape of the baby's mouth so that the teeth will come in crooked and irregular.

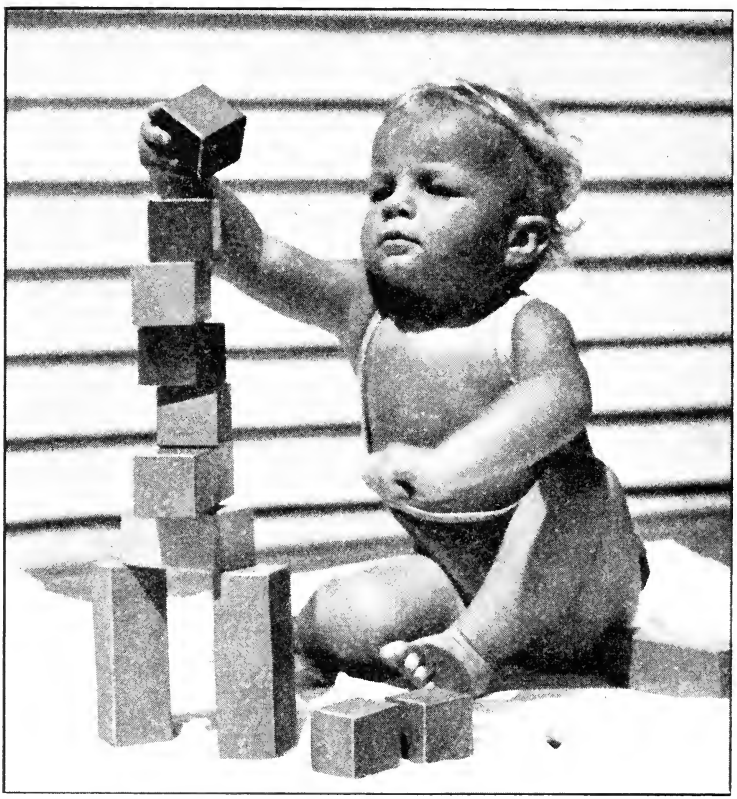
Of course you would not tease your two- or three-year-old brother or sister by taking away from him something he should have. But if he makes a fuss just because he cannot have something like candy which you know he should not have, then the best thing to do is to pay no attention to him. Let him

kick and scream. Do not give him the thing he is trying to get by making a fuss. If you do, you will be teaching him to get what he wants by being disagreeable.

What should you do if a two- or three-year-old child says "No," when you tell him to do something? A three-year-old often says *no*. Be sure first that what you ask him to do is reasonable. Then speak slowly and distinctly and in words that he knows. Try to make him understand why he should want to do the thing you are suggesting. Do not get angry with him and punish him because you are annoyed. Do not frighten him by telling him that the policeman or the "bogy-man" will get him if he isn't good. Let him help you make plans. Make it pleasant for him when he is good. Some people pay attention only to bad children. Good children like to get attention. These are important things to remember when you are taking care of small children now or later on in life.

What should you give the little children to play with? When the year-old baby is not sleeping, he should have something to play with. He likes bright-colored balls and birds and dolls made of soft cloth or wood. He likes sets of pans and boxes that fit one into the other. Books with pages that will not tear are the best for him. He likes large pegs to fit into

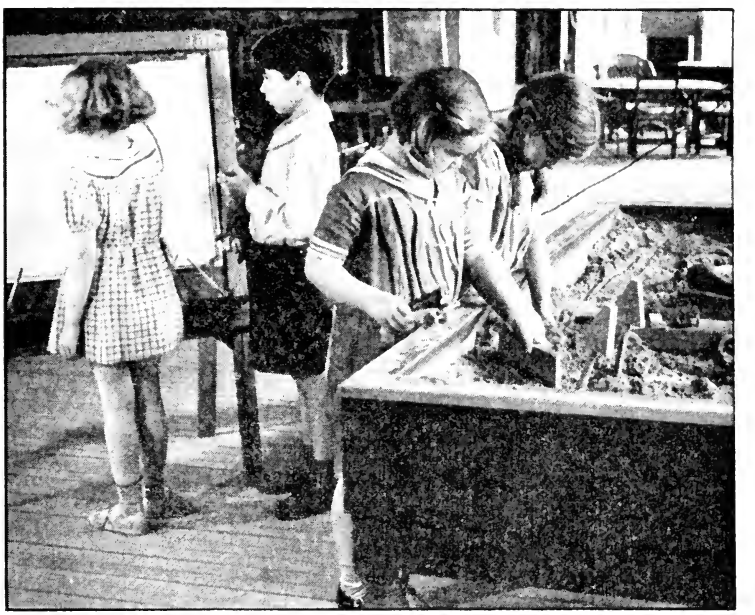
the holes in a board. He likes to be taken where he will see new sights and hear new sounds.



What other toys does the baby like?

The two-year-old likes all kinds of natural playthings — flowers, pet animals, trees. Animals that he can watch are better than animals that he can

handle, because it is so hard to keep animals really clean. They run about in all kinds of places. Bacteria cling to their hair or fur. The two-year-old also likes little wagons that he can pull. He likes



Indoor play of four-year-olds

to play in the sand. Indoors he likes dolls and dolls' furniture, crayons, blocks, and picture books. Children three and four years old like big boxes of all sizes, swings, seesaws, wagons, kiddie cars, balls, and many other playthings.

If you give your little brothers or sisters suitable

things to play with, you will not have much trouble in taking care of them. Some of the toys children like best cost very little money.

How long should the baby sleep? The newborn baby sleeps about twenty out of the twenty-four

How long should the baby sleep?

hours. Between the ages of one and two years, thirteen to fifteen hours are recommended. For children from two to four years old, twelve to fourteen hours' sleep; and from four to six, eleven to thirteen hours' sleep are recommended. Nine to ten and one-

half hours of sleep are best for most boys and girls of your age. Help your little brothers and sisters to get as much quiet sleep as they require. The baby's bedroom should be dark and quiet and have fresh, clean air moving gently through it. Does your bedroom have these good points, too?

The Child's Food

What should you give the baby to eat? If you have a doctor who tells your mother what to give the baby to eat, all you have to do is to obey the doctor's orders and see that the baby has his meals on time. Regularity of feeding is important.

By the end of the first year strained vegetables, baked potato, egg yolk, chopped liver, cod-liver oil, orange juice, applesauce, and stale bread and toast should have been added, in very small amounts at first, to the milk which is the foundation of the baby's diet. Patent foods often make a baby fat without furnishing the necessary minerals and vitamins.

In the second year he is given these same foods in larger amounts. In the third and fourth years his meals are very much like yours:

Breakfast

Orange juice
Cod-liver oil
Cereal with top milk
Toast and butter
Milk to drink

Dinner
- Baked potato
- Finely chopped green vegetable
- Small piece of liver
- Bread and butter
- Milk pudding
- Milk to drink

Afternoon Lunch
- Milk
- Graham crackers

Supper
- Cereal and milk
- Milk to drink
- Bread and butter
- Stewed fruit such as apple-sauce, or pears, or mashed banana

If milk and vegetables have always been served in an attractive form when the baby was feeling happy, the chances are that he will eat willingly these wholesome foods. If, however, the child has learned to dislike these foods, you will have to use patience in overcoming the dislike.

Milk need not always be served as milk to drink. Some children who do not like plain milk take it willingly when it is made into a cereal pudding or custard or flavored with a little cocoa or fruit juice. If a child does not like green vegetables, do not force him to eat them every day cooked in the same old way. One day chop the vegetable very fine and make it into a milk soup. Another day serve it chopped, buttered, and sprinkled with hard-cooked egg yolk. Another day put some lemon juice on it. Never say you do not like any of the wholesome foods.

Little children are quick to imitate older members of the family.

If you are taking care of small children, do not allow anyone to give them sweets between meals. Sweets will take away their appetite for the vege-

Best food for the baby

tables and milk they should have at mealtime. If your little brothers or sisters refuse to eat at mealtime, let them go hungry until the next meal.

If you go to the zoo, you will see a sign which says: "Do not feed the animals." The keeper of one zoo was asked why that rule was made. He said: "We used to have a great many digestive disorders among

the animals as a result of overfeeding by visitors; but by forbidding people to feed the animals and by giving each animal the amount of food it needs, the animals are kept healthy." Should you not take as good care of your small brothers and sisters as the keepers do of the animals in the zoo?

The Child's Safety

How can you protect the baby from illness and accidents? People with colds and other communicable diseases should keep away from other people. But some do not. You may have to say to some people with colds: "Please don't go near the baby. He catches cold so easily. He feels so miserable when he has a cold. Colds often lead to other serious illnesses." Babies should be protected against diphtheria* before they are a year old by toxin-antitoxin* or toxoid* treatment.

A two- or three-year-old likes to look at and handle things. The wise big brother or sister who is minding the baby will try to see that there is nothing around the house that will harm the baby. If the baby has balls, blocks, cups, pans, a little wagon, picture books, or sand to play with, a big brother or sister will have a chance to read or study in the meantime.

Some of the things that may be dangerous are: Kettles with hot liquid near the edge of the stove,

sink, or table; tubs or boilers of hot water on the floor; matches; small objects, such as coins, seeds, tacks, buttons, marbles, jacks, pebbles, pins, and the like, which the baby might put into his mouth and perhaps swallow or choke on; toys that have small parts which the child might pull off, such as a teddy bear with button eyes not fastened securely, or beads on a string that might break; toys with sharp points or edges; scissors, knives, razors, and any other objects with sharp points and edges; foods that have seeds, pits, nuts, or stems; pointed sticks, bows and arrows, guns; opened tin can with sharp edges; bits of broken glass or china; a lamp or heavy object on a tablecloth which a child might pull over on him; poisonous substances, such as iodine.

Using this list as a check list, one can in five minutes be sure that none of these things and no others like them are within reach of the baby.

At the same time, a big brother or sister can gradually teach the baby to use some of these objects in a safe way. For example, a year-and-a-half-old baby can be taught to bring any pins he finds directly to his sister. Every time he does so, sister should smile and otherwise show her approval. The baby's hand can be held very near the iron or the coffee pot, so that he will know how disagreeably hot it is and avoid touching it. Many boys and girls have fun

teaching the baby all these and many other useful habits. And it is well worth all the time and patience it takes.

Things to Do

1. If your small brother or sister does not like milk to drink, make some dishes using milk for him, such as milk shakes, milk soups, and egg-and-milk drinks.

2. Also see that your small brother or sister has safe water to drink. Read pages 154 to 160 again to review the reasons why water is important. 3. Ask your teacher to tell you where to get some books or bulletins about taking care of young children. Read from one or two of these books and tell the class what you have learned.

4. Make a list of indoor and outdoor playthings suitable for your small brothers and sisters. Ask your mother and aunts to give the children some of these playthings for Christmas or birthdays. 5. Ask your doctor to tell you what he thinks are the most important things to do in taking care of the baby. Write these down and try to do them when you are taking care of the baby. 6. Form a club in your school in which you will learn a great deal about taking care of babies and small children. The school nurse may help you form this club.

7. Write the food which a small child whom you know eats every day. Opposite each food write the food elements it contains: carbohydrates, fats, proteins, iron, calcium, phosphorus, and vitamins. Are all the important food elements included? If not, add to your list

foods which will furnish the elements that are lacking. Does your own food contain all these elements?

8. Make a list of things which often cause accidents to small children. Tell in class the ways in which these causes of accidents may be prevented in your home, in the school, and in the neighborhood. 9. Teach some small child you know to: (*a*) wash his hands before eating, (*b*) use only his own towel and washcloth, (*c*) cover his mouth and nose when he coughs or sneezes, (*d*) keep his hands away from his face.

TESTS EVERY DAY

Making Friends

You take tests not only at examination times. You are taking tests every day — the important tests of getting along with people and of being successful and happy yourself.

You can make a game of getting along with people. Ruth did. When Ruth moved to a new school in the city, she was very unhappy. She had left all her old friends — the boys and girls with whom she had played ball and roller-skated and gone on walking trips. The boys and girls in the new school all had their special friends. They talked to her in school, of course, but they did not ask her to join them in their games and clubs. She felt very lonely.

She did not know how to make new friends. What should you have done if you had been in her place?

Her mother said: "Try to find out what the other boys and girls are interested in. Find out what

A club meeting

Working together is a fine way to make friends.

each one likes to do. Find out what each one can do especially well." Ruth did this. Soon she began to make friends. Now she has many friends and she

has learned how to be happy with all kinds of people — rich people and poor people, old people and young people. The secret, she says, is being really interested in other people.

There is a story about a stranger who was traveling through a new country. He met a person who had lived in that part of the country for a long time. You may have heard of such an *old-timer*.

"Old-timer," said the stranger, "what kind of folk live here?"

"What kind of folk lived in the country you came from, friend?" asked the old-timer.

"Oh, they were mean, disagreeable, quarrelsome people," said the stranger.

"I reckon you'll find the same kind of people here," said the old-timer.

Another stranger came through the same country and met the old-timer.

"Old-timer," he said, "what kind of folk live here?"

"What kind of folk lived in the country you came from, friend?" asked the old-timer.

"Oh, they were kind, friendly, agreeable people," said the stranger.

"I reckon you'll find the same kind of people here," said the old-timer.

Do you think the two strangers found the same

kind of folk in the new town that they had found in their former home towns? Why?

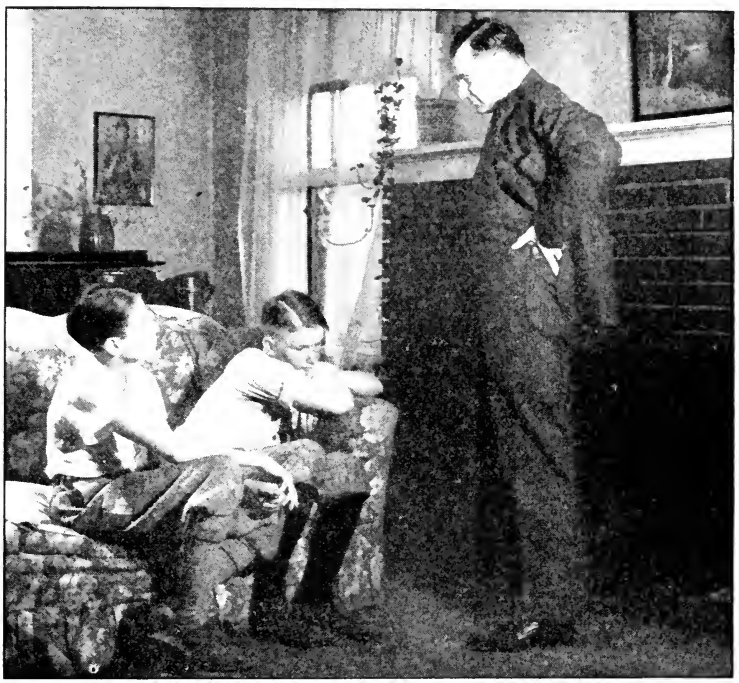
Avoiding Family Quarrels

Bill had a younger brother, George. Often Bill thought he was punished for things which George did and which were not really Bill's fault. One day Bill and George were getting dressed. George grabbed Bill's socks and threw them up on the bookshelf. Bill was in a hurry and gave them a jerk. Down came a bottle of ink too. It spilled over the new rug. Their mother was very angry. Their father came in. George said: "Bill did it." What should you have done if you had been in Bill's place?

Bill told exactly what happened. He admitted that he should not have pulled his socks down so hastily. But he also said he should not have been interfered with when he was dressing. Bill's father agreed that both boys were to blame. Bill used to get very angry at his younger brother, but he soon learned that getting angry made matters worse. Now he pays no attention to a great deal of George's teasing, and George does not bother Bill much any more because he gets no satisfaction from it.

You can form habits of being interested in other people, of meeting people in a friendly way, and of

avoiding quarrels with your brothers and sisters and friends, just as you form habits of brushing your teeth or washing your hands before eating. Try it.



What do you think the father is saying to Bill and George?

Facing the Facts

Face facts fearlessly. It is often hard to pass this test. One day Tom lost his brother's fountain pen. What should you have done if you had been in

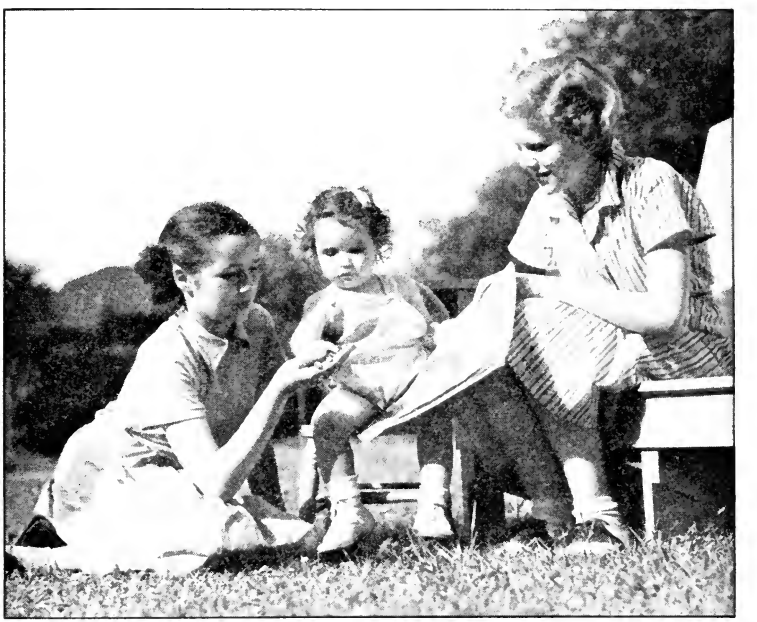
Tom's place? Tom told his brother: "I lost your fountain pen today, Arthur. But I'll buy you another one as soon as I can earn the money." Tom got work with a grocer, delivering orders after school and on Saturday. He was very much pleased when he could buy his brother a new pen just like the one which had been lost.

Tom did not stop working after he had earned money for the pen. He and one of his friends took turns delivering the groceries. Tom worked one day and his friend worked the next day. In this way they had some afternoons for play and some afternoons for work.

Mary got a low mark in arithmetic on her report card one month. What should you have done if this had happened to you? Mary went to the teacher after school to find out the reason for the low mark. The teacher showed her the problems in which she needed more practice and gave her practice exercises to do. Mary is sure her work will be better next month.

There was to be a picnic one day in June. Alice and her sister Katherine were looking forward to going. But when the day came, their mother was ill. The usual Saturday work had to be done. The baby had to be taken care of. Alice and Katherine could not go to the picnic. What should you have

done if this had happened to you? Since they could not go, they decided to make the best of it. "It wouldn't be fair to mother," Alice thought, "for us to be unhappy and disagreeable." She said: "Let's get the work done and then have a picnic of our own."



So they divided the work and ran a race to see who could finish first. They made a surprise lunch for their mother and took it to her on an attractive tray.

After lunch they were tired and read a new story-book while the baby was asleep. Later in the after-

noon they went out of doors and played with the baby. They planned a picnic supper which they ate with their father under the trees. "I don't believe we should have had much more fun if we had gone to the picnic," they told their father.

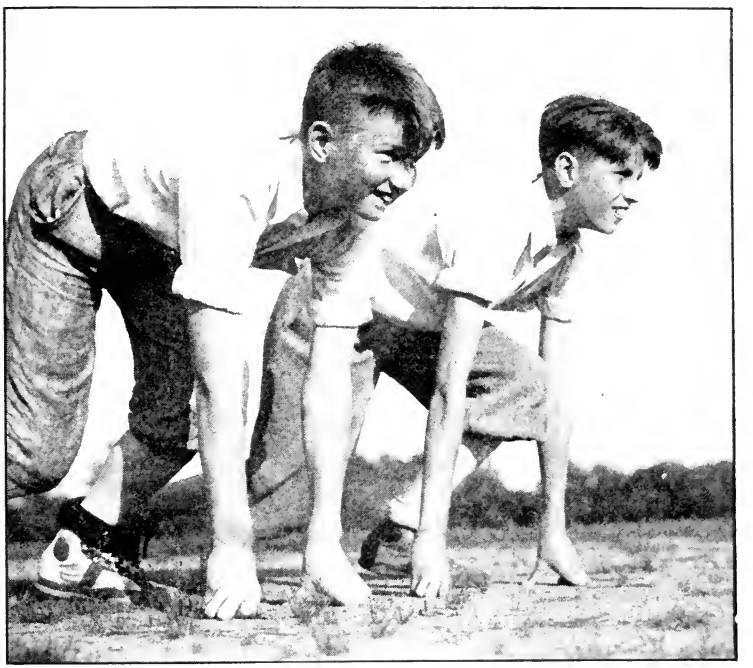
Jim entered the athletic meet in his school with high hopes of winning. His friend Ted was in the meet too. When the day came, Ted won the broad jump and the high jump. Jim was in the fifty-yard dash. "On your marks, get set, go!" Jim crossed the finish line third. What should you have done if you had lost the race? Jim's first thought was to go to the dressing room, change his clothes, and sneak home without seeing anyone. But he didn't do that. Instead, he found Ted and said: "That was great jumping, Ted. You certainly know how to jump."

The next day he went to the physical-education teacher and learned more about running. The physical-education teacher gave him the following rules to practice:

1. Get a good start. At the command "Go" give a strong push from both feet.
2. Keep the body low and the weight forward.
3. Toe in and push with the feet.
4. Keep your eyes straight ahead. A straight line to the goal is the shortest distance.
5. Don't slow up near the finish. Run beyond it.

Jim is practicing these points and has greatly improved his form in running.

Working and playing wholeheartedly. Habits of working and playing wholeheartedly are most



Good form in racing

important. Some boys and girls spend half of their school time looking around the room, playing with an eraser, daydreaming, or talking with other pupils. Other boys and girls spend practically all of their time in school studying and thinking as hard as they can.

The boys and girls who spend their study periods really studying are forming habits of good attention. They have time for play after school because they have done so much of their studying in school. They do not have to say: "No, I cannot go skating this afternoon; I have to study," because they have spent all their time in school to good advantage.

Meeting difficulties. If you are really doing your best and are still failing in your school work, you need help in selecting the kind of work or the kind of school in which you can do good work. Talk it over with your teacher, with someone else who knows your ability, or perhaps with someone whose special work is to help boys and girls to find out the kind of work they can do best.

Things to Do

1. Think over the past week and write down the situations in which you faced facts and did not try to imagine things different, or blame someone else, or say you did not care, or stop trying. 2. Keep a record one morning of the way you spend your time in school.

3. Think of some characters in stories you have read whom you admired greatly. List the things they did which made you admire them. Think of the real people you like best. List the things they do which make you like them. For example, you usually like people who praise you for doing a good piece of work. You like

people who help you to succeed in something in which you are much interested. Practice doing these things yourself. See how often you can make other people feel happy and friendly toward you. Getting along with other people and making friends easily is a very important part of life. Everyone must learn to do this.

4. Make a list of the advantages of being a baby. Make another list of the advantages of being grown up. Are you well on your way toward becoming grown up? **5.** Turn back to the chapter on posture. Follow the directions for sitting and standing in good posture. How do you feel about yourself when you are sitting and standing "tall?" **6.** Write all the good habits suggested in this chapter. Mark yourself on each one.

7. Practice habits of self-control. Boys and girls should not have to be controlled by parents and teachers. They should learn to control themselves, so that they do the things they ought to do of their own accord. Make a list of times when you can practice self-control. The following are a few of many ways: getting up in time in the morning; choosing the healthful food whenever choice is offered; not getting angry; conquering fear of the dark or other harmless things. Above all, youth today must learn self-control in regard to alcoholic drinks. **8.** Look through a newspaper and cut out all the advertisements of alcoholic drinks and all the advertisements of milk and other food. Which is given the more space? What untrue statements do you find? In daily papers and in magazines people are urged to buy whisky, beer, and wine. They must resist

these false appeals. Alcoholic drinks decrease a person's self-control. They lessen his ability to act quickly and to think and to judge quickly, clearly, and justly.

APPENDIX: WEIGHT IN RELATION TO AGE, HEIGHT, AND TYPE

(Based upon the tables of BIRD T. BALDWIN, PH.D.)

INSTRUCTIONS FOR USE OF CHART

1. Before the pupil is measured, it should be determined by careful observation to which physical type he belongs. In case of doubt it may be helpful to note that the Nordic races (central and northwestern Europe) are usually of the tall, slender type; the southern European or Mediterranean races are usually of the short, stocky type.

2. The pupil's height in inches should be taken against the scale of the type to which he belongs. A right-angled triangle or square placed against the wall and on top the pupil's head should be used to secure accuracy.

3. The following illustrations will serve to interpret the scale:

A 14-year-old boy of the tall slender type, 67 inches tall. He is of normal weight if he weighs 128 pounds; he would be considered underweight if he weighed under 115 pounds; and overweight if he weighed over 153 pounds.

A 15-year-old girl of the average type, 63 inches tall. She is of normal weight if she weighs 116 pounds; she would be considered underweight if she weighed under 104 pounds; and overweight if she weighed over 139 pounds.

(Courtesy Board of Education, Division of Physical and Health Education, The Board of Public Education, Philadelphia, Pa.)

TALL, SLENDER TYPE

BOYS

WEIGHT (Lbs.)					
Underweight	Overweight	Normal Weight	Age (Years)	Height (Inches)	
Under	Over				
147	195	163	19	72	
142	189	158	18		
140	187	156	17		
140	187	155	16		
138	183	153	15		
137	182	152	17	71	
136	181	151	16		
135	180	150	15		
133	177	148	17	70	
130	174	145	16		
130	173	144	15		
129	172	143	14		
125	167	139	15	69	
125	167	139	14		
121	161	134	15	68	
121	161	134	14		

GIRLS

Age (Years)	WEIGHT (Lbs.)			
	Normal Weight	Overweight		Underweight
		Over		Under
18	142	170		128
17	140	168		126
16	138	166		124
18	138	166		124
17	138	166		124
16	136	163		122
15	135	162		121
14	133	160		120

AVERAGE TYPE

BOYS

WEIGHT (Lbs.)					
Underweight	Overweight	Normal Weight	Age (Years)	Height (Inches)	
Under	Over				
				72	
143	191	159	19	71	
139	185	154	18		
140	187	155	19	70	
135	180	150	18		
137	182	152	19	69	
134	179	149	18		
131	175	146	17		
129	172	143	16		
132	176	147	19	68	
129	172	143	18		
127	169	141	17		
123	164	137	16		

GIRLS

Age (Years)	WEIGHT (Lbs.)			
	Normal Weight	Overweight		Underweight
		Over		Under

SHORT, STOCKY TYPE

BOYS

WEIGHT (Lbs.)				
Underweight	Overweight	Normal Weight	Age (Years)	Height (Inches)
Under	Over			
				72
				71
				70
				69
				68

GIRLS

Age (Years)	WEIGHT (Lbs.)		
	Normal Weight	Overweight	Underweight
		Over	Under

TALL, SLENDER TYPE												AVERAGE TYPE												SHORT, STOCKY TYPE											
BOYS						GIRLS						BOYS						GIRLS						BOYS						GIRLS					
WEIGHT (Lbs.)							WEIGHT (Lbs.)					WEIGHT (Lbs.)							WEIGHT (Lbs.)					WEIGHT (Lbs.)							WEIGHT (Lbs.)				
Under	Underweight	Over	Overweight	Normal Weight	Age (Years)	Height (Inches)	Age (Years)	Normal Weight	Over	Overweight	Under	Underweight	Under	Underweight	Over	Overweight	Normal Weight	Age (Years)	Height (Inches)	Age (Years)	Normal Weight	Over	Overweight	Under	Underweight	Under	Underweight	Over	Overweight	Normal Weight	Age (Years)	Height (Inches)	Age (Years)	Normal Weight	Over	Overweight	Under	Underweight
115	153	128	14	67	18	135	162	121	122	163	136	17	67							128	170	142	19	67											
					17	133	160	120	121	161	134	16								125	167	139	18												
					16	133	160	120	117	156	130	15																							
					15	131	157	118																											
					14	130	156	117																											
110	146	122	14	66	18	130	156	117	119	158	132	17	66							125	167	139	19	66											
107	143	119	13		17	129	155	116	115	153	128	16								122	163	136	18												
107	143	119	12		16	128	153	115	112	150	125	15																						
					15	125	150	112																											
					14	124	149	112																											
					13	124	119	112																											
105	140	117	13	65	15	122	146	110	110	146	122	16	65	18	126	151	113			121	161	134	19	65											
					14	121	145	109	108	144	120	15		17	125	150	112			118	157	131	18												
					13	120	144	108	106	142	118	14		16	123	148	111			115	152	127	17												
100	133	111	13	64	13	115	138	103	103	138	115	15	64	18	123	148	111			117	156	130	19	64											
98	131	109	12		12	114	137	103	102	136	113	14		17	122	146	110			113	151	126	18												
														16	120	144	108			109	145	121	17												
														15	119	143	107			105	140	117	16												
														14	117	140	105																		
96	128	107	13	63	13	110	132	99	99	132	110	15	63	18	120	144	108			115	152	127	19	63											
95	127	106	12		12	110	132	99	97	130	108	14		17	119	143	107			111	148	123	18												
														16	117	140	105			106	142	118	17												
														15	116	139	104			102	136	113	16												
														14	112	134	101																		
91	121	101	12	62	12	105	126	94	93	123	103	14	62	15	113	136	102			100	133	111	17	62	18	118	142	106							
									92	122	102	13		14	109	131	98			96	128	107	16		17	117	140	105							
														13	108	127	95			94	125	104	15		16	115	138	103							
86	115	96	12	61	12	100	120	90	89	119	99	14	61	14	105	126	94			93	123	103	16	61	18	116	139	104							
85	114	95	11		11	99	119	89	87	116	97	13		13	101	121	91			90	120	100	15		17	113	136	102							
																									16	112	134	101							
																									15	108	130	97							
83	110	92	12	60	12	95	114	85	84	112	93	13	60	13	97	116	87			86	115	96	16	60	18	111	133	100							
83	110	92	11		11	95	114	85												85	114	95	15		17	109	131	98							
																				85	113	94	14		16	108	130	97							
																									15	105	126	94							
																									14	101	121	91							
79	106	88	11	59	11	90	108	81	80	107	89	13	59	13	92	110	83			81	108	90	15	59	16	103	123	93							
78	104	87	10		10	87	104	78	80	107	89	12		12	90	108	81			81	108	90	14		15	100	120	90							
																									14	96	115	86							

APPENDIX: WEIGHT IN RELATION TO AGE, HEIGHT, AND TYPE (*Cont.*)

TALL, SLENDER TYPE									AVERAGE TYPE									SHORT, STOCKY TYPE								
BOYS					GIRLS				BOYS					GIRLS				BOYS					GIRLS			
Weight (Lbs.) Underweight (Under)	Weight (Lbs.) Overweight (Over)	Weight (Lbs.) Normal Weight	Age (Years)	Height (Inches)	Age (Years)	Weight (Lbs.) Normal Weight	Weight (Lbs.) Overweight (Over)	Weight (Lbs.) Underweight (Under)	Weight (Lbs.) Underweight (Under)	Weight (Lbs.) Overweight (Over)	Weight (Lbs.) Normal Weight	Age (Years)	Height (Inches)	Age (Years)	Weight (Lbs.) Normal Weight	Weight (Lbs.) Overweight (Over)	Weight (Lbs.) Underweight (Under)	Weight (Lbs.) Underweight (Under)	Weight (Lbs.) Overweight (Over)	Weight (Lbs.) Normal Weight	Age (Years)	Height (Inches)	Age (Years)	Weight (Lbs.) Normal Weight	Weight (Lbs.) Overweight (Over)	Weight (Lbs.) Underweight (Under)
76 76	101 101	84 84	11 10	58	11 10	86 84	103 101	77 76	76	102	85	12	58	12	86	103	77	78 77 76	103 103 102	87 86 85	15 14 13	58	15 14 13	96 93 88	115 112 106	86 84 79
72	96	80	10	57	10	82	98	74	73 73	97 97	81 81	12 11	57	12 11	82 82	98 98	74 74	75 74	100 98	83 82	14 13	57	14 13	88 84	106 101	79 76
69 68	92 91	77 76	10 9	56	10 9	78 76	94 91	70 68	69 69	92 92	77 77	12 11	56	12 11	79 78	95 94	71 70	70 70	94 94	78 78	14 13	56	14 13	83 81	100 97	75 73
65	86	72	9	55	9 8	74 72	89 86	67 65	66 66	88 88	73 73	11 10	55	11 10	74 74	89 89	67 67	67 67	89 89	74 74	13 12	55	13 12	77 75	92 90	69 67
63 63	84 84	70 70	9 8	54	9 8	70 69	84 83	63 62	63	84	70	10	54	11 10	71 70	85 84	64 63	64 64 63	85 85 84	71 71 70	13 12 11	54	13 12	73 71	88 85	66 64
60	80	67	8	53	8	67	80	60	60 60	80 80	67 67	10 9	53	10 9	68 67	82 80	61 60	61 60	82 80	68 67	12 11	53	12 11	69 68	83 82	62 61
58 57	77 76	64 63	8 7	52	8 7	64 63	77 76	58 57	58	77	64	9	52	10 9	64 64	77 77	58 58	58 58	77 77	64 64	11 10	52	12 11	67 65	80 78	60 58
55	73	61	7	51	7	59	71	53	55 55	73 73	61 61	9 8	51	9 8	61 60	73 72	55 54	55 55	73 73	61 61	11 10	51	12 11 10	65 63 61	78 76 73	58 57 55
52 51	70 68	58 57	7 6	50	7 6	56 56	67 67	50 50	52	70	58	8	50	8	57	68	51	52 52	70 70	58 58	10 9	50	11 10 9	61 59 58	73 71 70	55 53 52
49	66	55	6	49	7 6	54 54	65 65	49 49	49 49	66 66	55 55	8 7	49	8	55	66	49	49 49	66 66	55 55	10 9	49	10 9	56 55	67 66	50 49
47	62	52	6	48	6	52	62	47	48	64	53	7	48	7	52	62	47	48 48	64 64	53 53	9 8	48	10 9 8	53 52 52	64 62 62	48 47 47
44	59	49	5	47	6 5	50 49	60 59	45 44	45 45	60 60	50 50	7 6	47	7	50	60	45	45 45	60 60	50 50	9 8	47	9 8	50 50	60 60	45 45

GLOSSARY

This glossary explains the less common words in this book. The glossary includes also the words in the text that have a star (*) after them.

Key to Sounds

ā *as in* āte
å *as in* car'bon-åte
â *as in* câre
ă *as in* ăm
ă *as in* fi'năl
ä *as in* ärm
å *as in* åsk
ä *as in* so'fä
ē *as in* ēve
ė *as in* ė-vent'
ĕ *as in* ĕnd
ĕ *as in* move'mĕnt
ē *as in* moth'ēr
ī *as in* īce
ĭ *as in* ĭll
ō *as in* ōld
ȯ *as in* ȯ-bey'
ô *as in* ôr'der
ŏ *as in* ŏdd
ŏ *as in* cŏr-rect'
oi *as in* oil
o͞o *as in* fo͞od
o͝o *as in* fo͝ot
ou *as in* out
ū *as in* ūse
ů *as in* ů-nite'
û *as in* bûrn
ŭ *as in* ŭp
ŭ *as in* cir'cŭs
ŋ *as in* ink
th *as in* bathe
zh *like the* s *in* treas'ure

absorb (ăb-sôrb'). To swallow up; to soak up.

adenoid tissue (ăd'ė-noid tĭsh'ū). A group of cells forming a spongy growth or swelling that partly blocks the passage between the nose and the throat. Also called **adenoids.**

albumen (ăl-bū'mĕn). A kind of protein, as the white of egg.

alcohol (ăl'kȯ-hŏl). A col-

orless liquid which is the part of beer, wine, and whisky that intoxicates.

alimentary canal (ăl′ĭ-mĕn′-tȧ-rĭ). The continuous tube in which digestion takes place, including the mouth, gullet, stomach, and intestines.

arsenic (är′sĕ-nĭk). A very poisonous drug.

artery (är′tĕr-ĭ). A blood vessel leading away from the heart.

athlete (ăth′lēt). One trained to take part in games or exercises requiring physical skill and strength.

athletic (ăth-lĕt′ĭk). Of, or pertaining to, athletes or their exercises and games.

bacillus (bȧ-sĭl′ŭs). Any rod-shaped bacterium. The plural is *bacilli*.

bacteria (băk-tē′rĭ-ȧ). Microscopic living things belonging to the plant kingdom. The singular is *bacterium*.

beriberi (bĕr′ĭ-bĕr′ĭ). An acute disease of the nerves caused by a lack of vitamin *B*.

biology (bī-ŏl′ō-jĭ). The science of the origin, growth, structure, habits, etc., of plants and animals.

bladder. A strong, muscular bag or sac which holds the urine after it leaves the kidneys.

cafeteria (kăf′ē-tē′rĭ-ȧ). An eating place where one serves himself.

caffeine (kăf′ē-ĭn). A drug found in coffee, tea, and some other drinks.

calorie (kăl′ō-rĭ). A unit measure of the heat energy in food.

capillary (kăp′ĭ-lĕr′ĭ). One of the smallest, hairlike blood vessels joining the arteries and veins.

carbohydrates (kär′bō-hī′-drāts). One of a class of carbon compounds found in protoplasm, starches, sugars, and cellulose.

carbon (kär′bŏn). An element found pure, as in the diamond, but also in many compounds.

carbon dioxide (kär′bŏn dī-ŏk′sīd). A heavy gas given off from the lungs of animals or from decaying matter. It furnishes food for plants.

carbon monoxide (mŏn-ŏk′sīd). A colorless, very poisonous, odorless gas.

carrier. A person who carries the live bacteria of certain diseases in his body but is not himself sick with the disease.

cathartic (kȧ-thär′tĭk). A medicine which is used to clean or move the bowels.

cavity. A hollow place, such as the hole in a tooth from decay.

cells. The tiny living parts of which the body is built.

chemical (kĕm′ĭ-kăl). Relating to chemistry, the science of the composition of substances and of their changes.

chlorine (klō′rēn). A chemical element usually in the form of a poisonous, greenish-yellow gas which kills bacteria quickly.

circulation (sûr′kū-lā′shŭn). The movement of the blood from the heart through the arteries around the body and back to the heart through the capillaries and veins.

circulatory system (sûr′-kū-lȧ-tō′rĭ). The heart, arteries, capillaries, and veins, working together.

communicable (kŏ-mū′nĭ-kȧ-b'l). Capable of being passed from one person to another.

composition. The parts or elements of a substance.

concentrated (kŏn′sĕn-trāt′ĕd). Increased in strength by diminishing bulk or by purifying; condensed.

constipation (kŏn′stĭ-pā′-shŭn). A disturbance of the bowels, or intestines. Waste material is difficult to eliminate and collects in the intestine.

constituent (kŏn-stĭt′ū-ĕnt). An element; a part; an ingredient.

contagious (kŏn-tā′jŭs). Communicable.

corpuscles (kôr′pŭs-′lz). Very small cells floating in the blood.

culture (kŭl′tûr). A growing of microorganisms for scientific study or medical use.

culture medium (mē′dĭ-ŭm). The substance in which bacteria are grown for scientific study or medical use.

deficiency (dĕ-fĭsh′ĕn-sĭ). A lack of some element of completeness.

degeneration (dē′jĕn-ĕr-ā′shŭn). That condition of a tissue or organ in which its vitality has become lessened.

diaphragm (dī′ȧ-frăm). A broad dome-shaped muscle which forms the floor of the chest cavity and the roof of the abdominal cavity.

digestion (dĭ-jĕs′chŭn). The process by which food is changed into a form which can be used by the body.

diphtheria (dĭf-thē′rĭ-ȧ). An acute communicable disease in which whitish membranes are formed on the lining of the throat and respiratory passages.

ductless glands (dŭkt′lĕs glăndz). Glands which pour their secretion directly into the blood

stream; also called *glands of internal secretion* and *endocrine glands*. The thyroid gland is an example.

element (ĕl′ĕ-mĕnt). A substance which cannot be separated into other substances by chemical processes.

eliminate (ĕ-lĭm′ĭ-nāt). To send out or expel.

elimination (ĕ-lĭm′ĭ-nā′-shŭn). Act of sending out or expelling from the body.

emotional (ĕ-mō′shŭn-ăl). Expressing strong feeling.

epithelial (ĕp-ĭ-thē′lĭ-*a*l). Of the epithelium, meaning the outer (skin) covering or inner lining of the body.

essential (ĕ-sĕn′shăl). Most important; absolutely necessary.

excess. That which is beyond the limit of what is needed.

excretion (ĕks-krē′shŭn). The process of getting rid of waste or harmful material from the blood or tissues.

experiment (ĕks-pĕr′ĭ-mĕnt). A kind of test; a trial made to find out the truth about something.

fatigue (fȧ-tēg′). Weariness or loss of power from work or exertion.

fibrous (fī′brŭs). Consisting of, or similar to, hairlike fibers.

filter (fĭl′tĕr). To pass a liquid through material which will strain and clean it.

flabby (flăb′ĭ). Lacking in firmness; weak.

foci of infection (fō′sī, ĭn-fĕk′shŭn). Places in the body where bacteria are gathered in large numbers.

gall bladder. A small, baglike organ which holds the excess bile secreted by the liver. (Gall and bile are the same substance.)

gastric (găs′trĭk). Of, or relating to, the stomach.

generation (jĕn′ĕr-ā′shŭn). The average lifetime of man or animal.

gland. An organ of the body that secretes some useful fluid.

glucose (glōō′kōs). A kind of sugar which is formed in the body and carried by the blood.

goiter (goi′tĕr). Enlargement of the thyroid gland.

graham. A name given to flour made of the whole wheat grain or to the bread made of that flour.

gram. The unit of weight in the metric system. About 28.35 grams make an ounce.

gullet. The tube leading from the lower part of the throat to the stomach; the esophagus.

health examination. A thorough testing of the parts and work of the body to determine its condition.

hydrogen (hī′drŏ-jĕn). A gas which combines with oxygen to form water.

hyperacidity (hī′pĕr-ă-sĭd′-ĭ-tĭ). A condition of excessive acidity, as in the stomach.

immune (ĭ-mūn′). Protected against some disease by substances in the blood that make certain bacteria and their poisons harmless.

immunity (ĭ-mū′nĭ-tĭ). Freedom from and resistance to a certain disease.

indigestion (ĭn′dĭ-jĕs′chŭn). Poor digestion; discomfort during any part of the process of digestion.

indigestible (ĭn'dĭ-jĕs'tĭ-b'l). Not digestible, that is, not changeable for use as food.

infected (ĭn-fĕkt'ĕd). Contaminated with any disease-producing thing.

inflammation (ĭn'flă-mā'-shŭn). A condition in which there is redness, swelling, and often pain.

inherit (ĭn-hĕr'ĭt). To receive by birth.

insanitary (ĭn-săn'ĭ-tĕr'ĭ). Not sanitary; unhealthful.

intestinal (ĭn-tĕs'tĭ-năl). Of, or relating to, the intestines.

intestines (ĭn-tĕs'tĭnz). The bowels. The tube-like part of the digestive tract beginning below the stomach.

iodine (ī'ȯ-dīn). A chemical substance and one of the important elements in the thyroid secretion.

irritate (ĭr'ĭ-tāt). To make unusually sensitive. To anger or annoy.

kidneys (kĭd'nĭz). A pair of organs located in the abdomen near the spinal column which remove poisonous and unnecessary substances from the blood.

laboratories (lăb'ȯ-rȧ-tō'rĭz). Workrooms equipped for the experiments of a scientist.

laxative (lăk'sȧ-tĭv). A medicine given to relieve constipation by causing a bowel movement.

litmus paper (lĭt'mŭs). A paper treated with a dyestuff which is turned red by acids and blue by alkalies.

lymph (lĭmf). A fluid like blood, except that it contains no red corpuscles and is thinner, that is, less concentrated, than blood.

malaria (mȧ-lā′rĭ-ȧ). A disease due to a microorganism in which the patient has attacks of fever at regular intervals.

malnutrition (măl′nū-trĭ′-shŭn). Poor nutrition.

marrow (măr′ō). A soft substance which fills the cavities of many bones.

measles (mē′z′lz). A communicable disease in which the skin all over the body breaks out and the person has a fever.

medical (mĕd′ĭ-kăl). Of, or relating to, the science and art of preventing and curing, or relieving, disease.

menu (mĕn′ū). A list of foods served in a meal; a bill of fare.

microorganism (mī′krō-ôr′găn-ĭz′m). A plant or animal so small that it can be seen only under the microscope.

microscope (mī′krō-skōp). An instrument which makes anything put under its lens look many times larger than it really is.

microscopic (mī′krŏ-skŏp′ĭk). Capable of being seen only under a microscope.

mineral. The part of food which is left as ashes when the food is burned. It is useful in the building of bone material.

mucous membrane (mū′-kŭs mĕm′brān). The lining of any passage or cavity of the body.

muscular (mŭs′kū-lēr). Of, relating to, or consisting of a muscle or muscles.

nicotine (nĭk′ŏ-tēn). A poisonous substance contained in tobacco.

nitrogen (nī′trŏ-jĕn). A colorless, odorless gas; one of the chemical elements of which proteins are built.

nucleus (nū′klē-ŭs). The

central part of most cells. It contains a peculiar type of protein known as *chromatin* through which inherited characteristics are passed on.

nutrition (nū-trĭsh′ŭn). The process of supplying the body with whatever foods contribute to growth and development.

nutritious (nū-trĭsh′ŭs). Nourishing; helping the growth and repair of the body.

obesity (ō-bēs′ĭ-tĭ). The state of being very fat.

organ (ôr′găn). A part of the body or group of tissues that performs special, important duties.

oxygen (ŏk′sĭ-jĕn). A gas having no color, no odor, no taste. It is breathed with the air and is necessary for life.

pacifier (păs′ĭ-fī′ĕr). An object sometimes given to a baby to put into his mouth to keep him quiet.

pasteurize (păs′tĕr-īz). To kill, or check the growth of, bacteria in milk and other liquids by heating them to about 145° F. for thirty minutes.

perspiration (pûr′spĭ-rā′-shŭn). Sweat; a salty, watery liquid secreted by the sweat glands and oozing from the skin.

phosphorus (fŏs′fŏr-ŭs). An element which in various compounds is an essential part of teeth, bones, and all body cells.

physical defects. Faults or imperfections in some part of the body.

physiology (fĭz′ĭ-ŏl′ō-jĭ). The study of the processes or changes that go on in living animals and plants.

pituitary gland (pĭ-tū′ĭ-tĕr-ĭ glănd). A small, oval gland of internal se-

cretion located just below the brain.

pneumonia (nū-mō′nĭ-*ȧ*). A disease in which there is a serious inflammation of the lungs.

pollution (pŏ-lū′shŭn). A making unclean and unhealthful, as the pollution of water.

posture (pŏs′tûr). The position in which a person sits, stands, walks, etc.

protein (prō′tē-ĭn). A food substance especially abundant in white of egg, cheese, and lean meat.

protoplasm (prō′tō-plăz′m). The living matter of cells.

pyorrhea (pī′ŏ-rē′*ȧ*). A disease of the gums in which there is usually a discharge of pus and the teeth often become loose.

residue (rĕz′ĭ-dū). What remains; that which is left after a part is taken.

resistance (rē-zĭs′tăns). Ability to resist bacteria, infections, fatigue, etc.

respiratory (rē-spīr′*ȧ*-tō′rĭ). Of or pertaining to the act of breathing.

rickets (rĭk′ĕts). A bone disease usually affecting children and caused by a poor diet.

saliva (sȧ-lī′v*ȧ*). The watery fluid secreted by the glands of the mouth.

salivary (săl′ĭ-vĕr′ĭ). Of, or relating to, or producing saliva.

sanitarium (săn′ĭ-târ′ĭ-ŭm). A station or retreat to which the sick go for treatment.

sanitary (săn′ĭ-tĕr′ĭ). Of, or pertaining to, health; hygienic.

scarlet fever. A contagious disease in which the throat is sore, the skin of the mouth is red and rough, and there is a fever.

scientist (sī′ĕn-tĭst). A person who knows a great deal about science.

scurvy (skûr′vĭ). A disease due to poor nutrition in which the gums often become sore and bleeding, there is usually loss in weight, and communicable diseases are caught more easily.

secrete (sē-krēt′). To discharge from gland cells a special substance made from material taken from the blood.

serum (sē′rŭm). The watery part of the blood that is left after the blood has clotted.

soluble (sŏl′ū-b'l). Able to be dissolved in a liquid.

solvent (sŏl′vĕnt). A substance (usually liquid) able to dissolve certain substances.

sprain (sprān). To injure a joint by a sudden and severe twist.

sputum (spū′tŭm). Mucus from the throat, lungs, or nose, often mixed with saliva.

stimulate (stĭm′ū-lāt). To excite to activity.

susceptibility (sŭ-sĕp′tĭ-bĭl′ĭ-tĭ). Sensitiveness; liability to get a certain disease.

tendency (tĕn′dĕn-sĭ). Movement or inclination in a particular direction.

thyroid (thī′roid). A large ductless gland below the pharynx in the neck.

tincture (tĭŋk′tûr). A solution of a medicinal substance, usually in alcohol.

tissue (tĭsh′ū). A collection or mass of similar cells which perform a similar activity.

tonsil (tŏn′sĭl). One of a pair of spongy growths at the back of the mouth.

tonsillitis (tŏn′sĭ-lī′tĭs). An inflammation of the tonsils caused by bacteria.

toxin-antitoxin (tŏk′sĭn-ăn′tĭ-tŏk′sĭn). A mixture of toxin and antitoxin injected into the body to stimulate it to produce substances which will neutralize similar toxin in the future.

toxoid (tŏk′soid). A form of weakened toxin used very successfully with babies less than a year old in place of toxin-antitoxin to prevent them from getting diphtheria.

tubercle (tū′bĕr-k'l). A small, rounded growth produced by disease, especially in tuberculosis.

tuberculin (tū-bûr′kū-lĭn). A sterile liquid containing the growth products and proteins of the tubercle bacilli.

tuberculosis (tū-bûr′kū-lō′sĭs). A communicable disease caused by the tubercle bacilli.

typhoid fever (tī′foid fē′vĕr). A very serious disease caused by a certain kind of bacterium (the typhoid bacillus) usually carried by food or drink.

ultra-violet light (ŭl′trȧ-vī′ŏ-lĕt līt). Invisible rays of light beyond the violet rays of the spectrum of sunlight.

urinate (ū′rĭ-nāt). To discharge urine; to "make water."

urine (ū′rĭn). A fluid excreted from the kidneys.

urine analysis (ū′rĭn ȧ-năl′ĭ-sĭs). A test to determine the substances that may be in urine.

vitamins (vī′tȧ-mĭnz). Substances in food necessary for growth and health.

voluntary (vŏl′ŭn-tĕr′ĭ). Produced by an act of choice; subject to the will.

windpipe. The tube which carries the air you breathe down to the lungs. The trachea.

X-rays (ĕks rāz). Rays which make materials transparent that cannot otherwise be seen through.

yellow fever. A disease caused by a microorganism carried by a certain kind of mosquito.

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